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Forest Service, Tongass National Forest
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Environmental Assessment, Decision Notice and Finding of No Significant Impact

Wrangell - Petersburg Weed Management Project

Wrangell and Petersburg Ranger Districts, Tongass National Forest

United States Department of Agriculture | Forest Service | Alaska Region
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File Code: 1950/2900
Date: July 11, 2013

Dear Planning Participant:

We are pleased to announce that the Wrangell-Petersburg Weed Management Environmental Assessment (EA), Decision Notice (DN) and Finding of No Significant Impact (FONSI) are available for your review. The documents are available online (http://www.fs.fed.us/nepa/fs-usda-pop.php/?project=37523) and at the Wrangell and Petersburg Ranger Districts. Hardcopies and CDs of the documents are available upon request.

The Decision Notice documents our decision to select Alternative 2 and the factors we considered in reaching the decision. This alternative was developed based on comments received during both scoping periods and input from the Forest Service Interdisciplinary Team.

This project establishes an integrated weed management plan that includes manual and mechanical treatments, and herbicides to eradicate, contain, or control existing and new weed infestations. The focus is on 441 acres of target weed species; those determined to pose a threat to the ecological integrity or desired condition of the sites they occupy. Non-target weed species, totaling 76 acres, will be treated incidentally when adjacent to target species or present in sensitive areas. This project also incorporates early detection-rapid response (EDRR), a strategy that allows for the treatment of new or previously undiscovered infestations within the project area using the same integrated approach planned for documented weed populations.

The Wrangell-Petersburg Weed Management Project caps the maximum treatment of weed populations at 200 acres per year with no more than 2,000 acres treated during the 10-year life of the project. Newly infested acres, as well as acres of re-treatment, will be included in the annual tally. Project design features (PDFs), designed to reduce potential adverse effect of weed treatments, will be implemented as outlined in the Wrangell-Petersburg Weed Management Environmental Assessment.

As District Rangers, we are responsible for this decision. Information concerning its implementation and the appeal rights are included in the Decision Notice.

We want to thank those of you who took the time to review and comment on this project. For more information, please contact Carey Case at 907-772-3871.

Sincerely,

ROBERT J. DALRYMPLE
District Ranger, Wrangell

JASON C. ANDERSON
District Ranger, Petersburg

cc: Charles Streuli, Patricia Krosse, Carey Case

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Wrangell-Petersburg Weed Management Project

Decision Notice and Finding of No Significant Impact

Lead Agency:	USDA Forest Service Tongass National Forest Wrangell Ranger District and Petersburg Ranger District
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Abstract

The Selected Alternative establishes an integrated weed management plan that includes manual and mechanical treatments, and herbicides to eradicate, contain, control or tolerate existing and new weed infestations. The project will focus on 441 acres of target weed species; those determined to pose a threat to the ecological integrity or desired condition of the sites they occupy. Non-target weed species, totaling 76 acres, will be treated incidentally when adjacent to target species or present in sensitive areas. The Selected Alternative also incorporates early detection-rapid response (EDRR), a strategy that allows for the treatment of new or previously undiscovered infestations within the project area using the same integrated approach planned for documented weed populations.

The Selected Alternative caps the maximum treatment of weed populations, including future expansion, to 200 acres per year with no more than 2,000 acres treated during the 10-year life of the project. Newly infested acres, as well as acres of re-treatment, will be included in the annual tally. Project design features (PDFs), designed to reduce potential adverse effect of weed treatments, will be implemented as outlined in the Wrangell-Petersburg Weed Management Environmental Assessment.

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Decision Notice and Finding of No Significant Impact

for the

Wrangell-Petersburg Weed Management Environmental Assessment

USDA Forest Service

Tongass National Forest

Wrangell and Petersburg Ranger Districts

Introduction

This Decision Notice (DN) contains a brief summary of the environmental analysis completed for the Wrangell-Petersburg Weed Management project, our decision regarding which alternative to implement, and the rationale for that decision. It also contains findings required by various laws and information concerning the right to Administrative Review of this decision. The Environmental Assessment (EA) completed for this project is incorporated by reference in this decision document.

Project Area Location

The project area is located on the Wrangell and Petersburg Ranger Districts of the Tongass National Forest (see Figure 1 of the EA).

Decision

Based upon our review of the analysis, comments from the public, and other documents provided for the Wrangell-Petersburg Weed Management Environmental Assessment (EA), it is our decision to implement the Proposed Action (hereafter called the Selected Alternative), in its entirety.

Any use of herbicides within Wilderness areas must be approved by the Regional Forester (FSM 2323.04c [USDA Forest Service 2007]). Use for this project was approved through the completion of a Minimum Requirements Decision Guide (MRDG) signed by the Regional Forester on June 28, 2013. Herbicide use on all National Forest System lands (including Wilderness areas), also requires the completion of a Pesticide Use Proposal (PUP) (FSM 2151 [USDA Forest Service 2013]), approved by the Regional Pesticide Use Coordinator and signed by the Regional Forester before implementation may occur (see Appendix B of the EA).

The Selected Alternative will eradicate, contain, control or tolerate existing and new infestations of weeds focusing on 441 acres determined to pose a threat to the ecological integrity or desired condition of the sites they occupy (see Table 1 in the EA for a list of the target species) (USDA Forest Service 2007).

Species on the non-target weed list, totaling 76 acres, will be treated incidentally when adjacent to target species or present in sensitive areas (see Table 5 in the EA).

The Selected Alternative caps the maximum treatment of weed populations including future expansion, to 200 acres per year, with no more than 2,000 acres treated during the 10-year life of the project. Newly infested acres, as well as acres of re-treatment are included in annual tally. Project design features (PDFs) will be implemented as outlined in the EA.

The Selected Alternative incorporates early detection-rapid response (EDRR), a strategy that allows the project to be responsive to the expansion of current weed populations, and new infestations in the project area.

Treatment prescriptions for each site will be evaluated, and site-specific considerations taken into account, before implementation occurs each year. The proposed prescriptions will be reviewed by the interdisciplinary team (IDT) and the Responsible Official (Section 2.4.4 of the EA, Step 4). Treatment prescriptions will utilize manual and mechanical treatments, as well as the use of three herbicides (aminopyralid, glyphosate and imazapyr).

Two types of monitoring will occur with implementation of the Selected Alternative: implementation monitoring, and effectiveness monitoring. At a minimum, implementation of any treatment plan will include annual accomplishment reporting. Accomplishment reporting is done through the Forest Service Activity Tracking System (FACTS). A requirement of accomplishment reporting is to delineate the infestation acres and treatment area, entering that information into the Natural Resource Inventory System – Invasive Species (NRIS-IS) database. In addition, treatment acres and treatment methods, including specific chemical brands used (for herbicide applications) are documented. Cost of treatments will also be documented and monitored throughout the project.

Effectiveness monitoring is intended to determine the effectiveness of treatment, and ensure treatment effects are within the bounds of what was analyzed in the EA. The restoration of treated sites will also be monitored.

Weed status and treatment effectiveness across the Tongass is summarized annually in the Tongass National Forest Monitoring and Evaluation Report (http://www.fs.usda.gov/main/tongass/landmanagement/planning).

Decision Rationale

Our decision to implement the Selected Alternative considered existing conditions, environmental effects, relevant issues, concerns and public comments. Our conclusion is based on the project-specific environmental analysis included in the EA, and a review of the record that shows a thorough analysis using the best available science. We also considered direction provided in the Forest Plan, National Environmental Policy Act, Endangered Species Act, Clean Water Act, and related regulations and policies.

The Selected Alternative allows for the eradication or control of existing and new infestations of weeds with a wide variety of treatment options (see Section 2.4.5 in the EA), including the use of herbicides, and EDRR. This alternative focuses treatment on target species (Table 1 in the EA), and allows for the incidental treatment of non-target species. Target species are difficult to control without the use of herbicides. Because of this, using only manual and mechanical treatment strategies will less likely eradicate infestations. Manual and mechanical treatments typically require more entries to gain control of

weeds. Time and costs to complete this work reduces the number of populations treated, and also leads to greater resource disturbance over the long-term.

Public comments expressed concern related to the use of herbicides, particularly glyphosate. In response to this concern, only aquatically approved versions of this herbicide will be used, along with low-risk, aquatically approved surfactants. Additionally, only spot-spray and hand application methods will be used to apply herbicide which limits the potential for airborne drift and lowers the potential for effects. Numerous project design features (PDFs) have been incorporated into the Selected Alternative to minimize direct adverse impacts of herbicides to sensitive plant species, fish, wildlife, soils and human health and safety.

While herbicide use in the Selected Alternative does carry a greater risk of adverse effects than Alternatives 1 or 3, it does provide an effective form of treatment for many weed populations. Combining the EDRR treatment strategy with herbicide while populations are small and scattered is expected to reduce overall treatment costs with less chemical use and adverse effects to human health over the life of the project.

All three herbicides proposed for use are considered to have low toxicity levels and consequently the inherent level of health risk is minimal and readily mitigated through full compliance with worker training requirements, herbicide label stipulations and PDFs for safe herbicide storage, transportation, use and disposal.

Effects of herbicides and manual and mechanical treatments to aquatic organisms and essential fish habitat (EFH) would be minimal due to the low number of infestations occurring within riparian management areas (RMAs) near Class I and II streams and along shorelines of the project area. Currently there are only 222 known acres of targeted weeds within RMAs of the 3.6 million acre project area.

The two primary weeds targeted in aquatic environments (reed canarygrass and common brassbuttons) do not lend themselves to manual and mechanical removal techniques. These techniques can result in an increase in overall population size, and higher, long-term risk to water quality and riparian condition, due to the increased potential for sedimentation and altered physical habitat on channel margins and riparian areas. For example, populations of reed canarygrass are often found in close proximity to streams and road crossings, site types with high potential for spread. Effective removal will help protect and preserve aquatic habitat and water quality.

Less soil erosion and sedimentation potential are expected with the implementation of the Selected Alternative compared to the other alternatives considered. The use of herbicides creates fewer disturbances to soil and protective vegetation cover which is generally disturbed to remove weed roots with only manual and mechanical treatments. Also manual and mechanical treatments generally take more repeated treatments than herbicides, adding to site disturbance. Increases in sediment from the minor ground disturbance associated with manual or mechanical treatments for smaller populations of weeds are not expected to contribute to an accumulation of downstream sediment. The removal of weeds in general will have a positive effect on aquatic habitat and diminish the potential for altered instream habitat resulting from the presence of weeds.

Aminopyralid, which has the greatest potential for contaminating water via drift, leaching to groundwater, or surface and subsurface runoff, will be minimized by prohibiting application within 10 feet of water bodies, using only hand applications and spot spraying, and applying to dry sites only when wind is minimal.

Based on the analysis for the Selected Alternative, use of aminopyralid, glyphosate and imazapyr are also below the level of concern for the major wildlife groups (i.e., birds, mammals, reptiles, amphibians, fish) at the proposed application rate ranges, and would not pose a risk to Management Indicator, candidate or sensitive wildlife species or their habitat. The inability to eradicate some weed species, by not allowing the use of herbicides, could potentially have a long-term adverse effect on native wildlife, due to weed competition with native browse.

We believe the three herbicides proposed for use, the herbicide application ranges, allowable treatment types, and the yearly treatment cap, combined with the application of Forest Plan Standards and Guidelines, best management practices (BMPs), and project design features (PDFs) developed specifically for this project, will minimize the potential for adverse environmental effects.

Singularly and collectively, the resources affected by the Selected Alternative are not likely to be exposed to significant impacts.

Issues

We chose the Selected Alternative because it best addresses the issues and concerns determined during scoping. Public comments primarily focused on the use of herbicides, with specific references to glyphosate. As a result, the seven issues covered in the EA have an emphasis on herbicide use. To address the concerns, a host of project design features (PDFs) were developed to keep the potential for effects to a minimum. We believe having the option to use herbicides provides long-term benefits to many resources during the 10-year life of the project. In conjunction with manual and mechanical treatments, it also provides a cost-effective means to treat many of the weeds currently found in the project area.

Alternatives Considered

Three alternatives are presented in the EA: a No Action Alternative, the Proposed Action (Selected Alternative) and Alternative 3, which was developed to respond to a scoping comment concerned about the use of herbicides. A comparison of alternatives is presented in the EA in Tables 10 and 11.

Public and Agency Involvement

Public involvement is a key component of the planning process. The following is a summary of the reports, contacts and meetings that have occurred during project planning:

January 1, 2012: Project first listed on the 2nd quarter of the FY 2012 Schedule of Proposed Actions for the Wrangell and Petersburg Ranger Districts.

March 8, 2012: Open house was held at the Petersburg Ranger District. A project poster was on display with a botanist in attendance to answer questions. Fourteen members of the public attended.

April 13, 2012: A scoping package describing the Proposed Action was mailed to 207 individuals and groups seeking comments on the proposed project. Seven responses were received. One included a letter with comments; another provided information about new radio frequency technology that could be used to treat weeds. The remaining five respondents either requested to be placed or removed from the project mailing list.

May 10, 2012: Public notices were published in two local newspapers, the Wrangell Sentinel and Petersburg Pilot announcing three public meetings for the project to be held in Wrangell, Petersburg and Kake, Alaska.

May 15, 2012: A public meeting was held at the Wrangell Ranger District with a 20 minute presentation to describe the project. The remaining time was available for the public to review maps, the proposed treatment areas and ask questions.

May 16, 2012: A public meeting was held at the Petersburg Ranger District with the same format as the May 15th meeting.

May 17, 2012: A public meeting was held in Kake, Alaska with the same format as the May 15th meeting.

February 27, 2013: Scoping report describing an updated Proposed Action and project description was made available online at http://www.fs.fed.us/nepa/fs-usda-pop.php/?project=37523. Letters providing this link were sent to 209 postal subscribers and 25 email subscribers. One response was received during the comment period.

Finding of No Significant Impact

In reaching our determination under 40 CFR 1508.27, it was determined that preparation of an environmental impact statement (EIS) is not needed. We considered the following factors and information developed during the analysis of the proposal disclosed in the EA.

Context

Context means that the significance of an action must be analyzed in several contexts (i.e., local, regional, worldwide) and over short and long timeframes. For site-specific actions, significance usually depends upon the effects in the locale rather than in the world as a whole (40 CFR1508.27(a)). Both short-term and long-term effects are relevant.

The 3.6 million acre project area is primarily undeveloped, with few population centers (Wrangell, Petersburg and Kake). This project covers a very large area, and the majority of documented infestations are small and scattered, or are individual plants. Currently there are 441 acres of known infestations. Fifty-nine of two hundred twenty-three Hydrologic Units (HUCs) in the project area have less than 1 percent of their area infested. The largest population in the project area (brassbuttons) is in the North Arm Duncan Canal HUC and totals 104 acres, or 0.3 percent of the total watershed acres (30,731). With the implementation of a project cap of 200 acres per year, or 2,000 acres over the life of the project (10 years), the total impact within the project area will be minimal.

The Selected Alternative will not have a significant affect to society locally or regionally, short-term or long-term.

Intensity

Intensity refers to the severity of expected project impacts. The following ten factors and their expected impacts are considered below.

The intensity of effects was considered in terms of the following:

Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect will be beneficial.

Neither adverse nor beneficial effects are significant in context or intensity to warrant an EIS for this project. Our finding of no significant environmental effects is not biased by the beneficial effects of the action. Tables 9 and 10 in the EA provide summaries of effects to a variety of resources, Chapter 3 of the EA is the analysis of effects, and impacts both beneficial and adverse are discussed for each resource.

The degree to which the Selected Alternative affects public health or safety.

Elements of public health and safety are discussed in several of the resource sections in Chapter 3 of the EA, including human health/herbicide toxicity (Section 3.1), hydrology (Section 3.5), Wilderness (Section 3.7), subsistence (Section 3.9) and recreation (Section 3.10). All sections conclude that the inherent level of public health and safety risk is minimal for the types of herbicides proposed for use in the Selected Alternative. In addition, public health and safety risk is readily mitigated through full compliance with worker training requirements, herbicide label stipulations and PDFs for safe herbicide storage, transportation, use and disposal.

Unique characteristics of the geographic areas such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

No historic properties, park lands or farmlands are located within the area of potential effects for the project. There are no designated Wild and Scenic Rivers in the project area. However, during the 1997 Forest Plan revision, ten river/lake systems were determined eligible and suitable for designation, and have been recommended for inclusion in the Wild and Scenic Rivers System. The Selected Alternative would not affect the eligibility of any of the segments recommended for inclusion in the Wild and Scenic Rivers System, and no high-value wetlands or high-vulnerability karst would be affected by the project. Therefore, we have determined there will be no significant effects on any unique characteristics of the area.

The degree to which the effects on the quality of the human environment are likely to be highly controversial.

Based on the analysis, the small scale of proposed treatments, and dispersed nature of the majority of weed infestation, the effects on the quality of the human environment are not likely to be highly controversial.

A scoping package describing the Proposed Action was mailed to 207 individuals and groups seeking comments on the proposed project. Seven responses were received. One included a letter with comments; another provided information about new radio frequency technology that could be used to treat weeds. The remaining five respondents either requested to be placed or removed from the project mailing list.

In February of 2013 a scoping report describing an updated Proposed Action, project description, and alternatives was made available for comment online. Letters were sent to 209 postal subscribers and 25 email subscribers. One response was received during the comment period stating support for Alternative 3, the non-herbicide use alternative.

In response to the scoping comments, the EA focuses on potential effects to human health, wildlife, hydrology, soils, and fish from the use of three herbicides. These comments can be found, with their associated responses in the project record.

Based on the level of outreach and the response, it is unlikely the effects to the human environment from this project would be highly controversial. Activities were designed to take the comments received into consideration, and to minimize or eliminate potential effects on the human environment and to resources.

The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

The primary information evaluated in this analysis is based on laboratory and field studies of herbicide toxicity, exposure and environmental fate to estimate the risk of adverse effects to humans and non-target

organisms. Formal risk assessments were done by Syracuse Environmental Research Associates, Inc. (SERA) using peer-reviewed articles from the available scientific literature and current Environmental Protection Agency (EPA) documents.

All three herbicides have been approved by US EPA and are certified for use by the State; therefore, it is unlikely the risks are highly uncertain or involve unknown risk. In addition, numerous design features have been incorporated into the Selected Alternative to reduce potential risks to the environment caused by the use of herbicides (e.g., reduce risks for spill, reduce the potential for drift, implement safety plans [including the need for personal protective equipment], allowing only aquatically labeled formulations of glyphosate, imazapyr, and low-risk aquatically approved surfactants, along with hand or spot treatments up to the banks of rivers and streams, comply with federal, state, and local laws including complying with label instructions).

The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

The Selected Alternative is project-specific and does not establish a precedent for future actions with significant effects. Any future actions not covered by this proposal will need to consider all relevant scientific, site-specific information available at that time, and an independent environmental analysis of environmental consequences. The project does not involve future connected actions.

Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.

Based on the cumulative effects analysis addressed for each resource in Chapter 3 of the EA, there will be no significant cumulative effects. The analysis determined that the Selected Alternative, when combined with other actions in the project area, will likely have beneficial cumulative effects related to reducing the spread of target weed species by mitigating their potential for increasing their distribution and abundance in the project area.

The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

The Forest Service has determined that a finding of No Historic Properties Affected is appropriate for this project. This project meets the provisions stipulated in the Programmatic Agreement between the Forest Service, Alaska Region, the Advisory Council on Historic Preservation, and the State Historic Preservation Officer. Therefore, we have determined no significant impacts would occur that adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural, or historical resources.

The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

The action will not adversely affect any endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973, because there are no listed species or critical habitat in the project area. Effects to the marine environment are anticipated to be negligible and consist of small pulses of sedimentation that will likely settle out in the estuary before reaching marine waters where marine mammals are present.

Therefore, we have determined no significant impacts would occur that adversely affect an endangered or threatened species or its habitat. The Biological Evaluations concluded there was "No Effect" for any threatened or endangered species or their critical habitats.

Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

The following findings show the action does not violate federal, state or local law requirements imposed for the protection of the environment and has been reviewed by federal and state agencies. The action is consistent with the Forest Plan.

Findings Required by Other Laws and Regulations

Many federal laws and executive orders pertain to project-specific planning and environmental analysis on federal lands. While most of the laws and executive orders listed below pertain to all federal lands, some of the laws are specific to Alaska.

Several of the laws and executive orders listed below require project-specific findings or other disclosures. These apply to federal land management projects and activities and are included here. They apply to all alternatives considered in this EA.

Alaska Drinking Water Regulations (18 AAC 80)

The Alaska Division of Environmental Health Drinking Water Program requires public water systems to be in compliance with state drinking water regulations in accordance with the Federal Safe Drinking Water Act and Amendments, for the public health protection of the residents and visitors to the State of Alaska.

Alaska National Interest Lands Conservation Act (ANILCA) of 1980

An ANILCA Section 810 and 811 subsistence evaluation was conducted. The evaluation can be found in the subsistence section of the EA. No significant restrictions on the abundance and distribution of, access to, or competition for subsistence resources in the project area are anticipated.

Alaska Water Quality Standards (18 AAC 70)

Alaska Water Quality Standards are approved by the Environmental Protection Agency (EPA) for actions regulated under the federal Clean Water Act.

Bald and Golden Eagle Protection Act of 1940 (as amended)

All alternatives would be in accordance with the interagency agreement established with the USFWS to maintain habitat to support long-term nesting, perching and winter roosting habitat for bald eagles.

Clean Water Act

Congress intended the Clean Water Act of 1972 (Public Law 92-500), as amended in 1977 (Public Law 95-217) and 1987 (Public Law 100-4), to protect and improve the quality of water resources and maintain their beneficial uses. Section 313 of the Clean Water Act and Executive Order 12088 of January 23, 1987 address federal agency compliance and consistency with water pollution control mandates. Agencies must be consistent with requirements that apply to "any governmental entity" or private person. Compliance is to be in line with "all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution".

The Clean Water Act (Sections 208 and 319) recognizes the need for control strategies for nonpoint source pollution. The National Nonpoint Source Policy (December 12, 1984), the Forest Service Nonpoint Strategy (January 29, 1985), and the USDA Nonpoint Source Water Quality Policy (December 5, 1986) provide a protection and improvement emphasis for soil and water resources and water-related beneficial uses. Soil and water conservation practices (BMPs) were recognized as the primary control mechanisms for nonpoint source pollution on National Forest System lands. The Environmental Protection Agency supports this perspective in their guidance, "Nonpoint Source Controls and Water Quality Standards" (August 19, 1987).

The Forest Service must apply best management practices to achieve Alaska Water Quality Standards. The site-specific application of BMPs, with a monitoring and feedback mechanism, is the approved strategy for controlling nonpoint source pollution as defined by Alaska's Nonpoint Source Pollution Control Strategy (October 2007). BMPs are incorporated into the Tongass Land Management Plan.

As required by the Clean Water Act, Section 402, a State of Alaska pesticide-use permit, as well as an Alaska Pollution Discharge Elimination System (APDES) permit will be acquired prior to implementing herbicide treatments. Permitting requirements for herbicide application are rigorous and can be reviewed at http://www.dec.state.ak.us/eh/pest/requirements.html. State reporting and monitoring requirements associated with these permits will occur annually.

Endangered Species Act (ESA) of 1973 (as amended)

Provides for the conservation of threatened and endangered species of plants and animals. Section 7 of the Act requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of the species' critical habitat. This section also requires federal agencies to consult with the U.S. Fish and Wildlife Service (for non-marine species) or the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) whenever an agency action is likely to affect a threatened or endangered species or result in the destruction or adverse modification of its critical habitat.

Fisheries and plant biological evaluations were prepared which resulted in determinations of "no effect" to any threatened, endangered or sensitive species. A combined BE and BA was completed for wildlife. USFWS was not consulted since the wildlife biologist determined "no effect" to any threatened and endangered species. The biological evaluations and assessment are included in the project record.

Standards and Guidelines have been applied, as needed, to ensure that any listed threatened or endangered species or its habitat would not be adversely affected. The Forest Plan contains Standards and Guidelines for each designated sensitive species, and these are incorporated into the project as applicable.

Federal Cave Resources Protection Act

No know significant caves in the project area would be directly or indirectly affected by project activities.

Federal Insecticide, Fungicide and Rodenticide Act

Describes pesticide regulations and requirements related to hazardous material use and worker protection standards for employees in the planning and application of pesticides.

Under the OSHA Hazard Communication Standard (Section 1910.1200), employers must provide workers with training, protective equipment, and information about hazardous substances. The employer is also required to maintain Material Safety Data Sheets (MSDSs) about these substances and to provide

the employee with a copy of the sheets if they are requested. MSDSs for some common chemicals can be obtained at the following websites:

Greenbook - http://www.greenbook.net/

Seed Search - http://www.cdms.net/manuf/acProducts.asp

Ranger districts must maintain a current set of MSDSs for any herbicides used within the project area. A copy of the label with the MSDS is also maintained.

Magnuson-Stevens Fishery Conservation Act of 1996

Requires that all federal agencies consult with NMFS when any federal action is determined by the Forest Service to "may adversely affect" Essential Fish Habitat (EFH). The Forest Service's position is that treating weeds with herbicides may have an adverse effect on EFH. However, by following the measures to minimize adverse effects listed in the EFH Assessment, other Standards and Guidelines from the Forest Plan and implementing the best management practices (BMPs), the effects on EFH would be minimized and would not degrade fish habitat. A copy of the EFH Assessment was sent to the National Marine Fisheries Service (NMFS) to initiate formal consultation. NMFS did not submit comments. This satisfies the EFH consultation requirement based on the 2007 Agreement with NMFS.

Marine Mammal Protection Act of 1972

Prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.

Migratory Bird Treaty Act of 1918 (as amended)

Implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful. This action is not anticipated to have any effects on migratory birds.

Multiple-Use Sustained-Yield Act of 1960

Authorizes the Secretary of Agriculture to: administer National Forest System lands for outdoor recreation, range, timber, watershed, and wildlife and fish purposes; to develop the surface renewable resources for multiple use and sustained yield of several products and services to be obtained from these lands, without impairment of the productivity of the land; and, to cooperate with interested state and local governmental agencies and others in the development and management of the national forests. The Act also recognizes and clarifies Forest Service authority and responsibility to manage wildlife and fish on national forests.

National Forest Management Act

All project alternatives fully comply with the Forest Plan. This project incorporates all applicable Forest Plan Forest-wide Standards and Guidelines and management area prescriptions as they apply to the project area, and complies with Forest Plan goals and objectives. All required interagency review and coordination has been accomplished; new or revised measures resulting from this review have been incorporated.

The Forest Plan complies with all resource integration and management requirements of 36 CFR 219 (219.14 through 219.27). Application of Forest Plan direction for the Wrangell-Petersburg Weed Management Project ensures compliance at the project level.

National Historic Preservation Act

Requires agency heads to assume responsibility for the preservation of historic properties owned or controlled by the agency and to develop a preservation program for the identification, evaluation, and nomination of historic properties to the National Register. Management activities to protect and preserve historic properties and cultural sites may include actions to prevent and control invasive species threatening or impacting those areas. The Act requires agency heads to evaluate the effects of an undertaking on property that is included or eligible for inclusion in the National Register and to afford the Advisory Council a reasonable opportunity to comment on the undertaking. Defines undertaking to include permitting activities or federal financial assistance under the jurisdiction of an agency.

Cultural resource surveys of varying intensities have been conducted, following inventory protocols approved by the Alaska State Historic Preservation Officer. Native communities have been contacted and public comment encouraged. The consultation and concurrence process with the State Historic Preservation Officer has begun. No effects on known cultural resources are anticipated.

National Invasive Species Act of 1996

The official purpose is "To provide for ballast water management to prevent the introduction and spread of non-indigenous species into the waters of the United States, and for other purposes."

Noxious Weed Control and Eradication Act of 2004

Amends the Plant Protection Act to direct the Secretary of Agriculture to establish a grant program to provide financial and technical assistance to weed management entities to control or eradicate noxious weeds.

Plant Protection Act of 2000

The Plant Protection Act of 2000 (7 U.S.C. 7701 et seq) as amended by the Noxious Weed Control and Eradication Act of 2004 (P.L. 108-412). Among other provisions, the Plant Protection Act authorizes the Secretary of Agriculture to prohibit or restrict the importation, entry, exportation, or movement in interstate commerce of any plant, plant product, biological control organism, noxious weed, article, or means of conveyance, if the Secretary determines that the prohibition or restriction is necessary to prevent the introduction into the United States or the dissemination of a plant pest or noxious weed within the United States. This project seeks to eliminate any weed currently on the State of Alaska prohibited and restricted list, which address this Act specifically.

Wilderness Act of 1964

Authorizes the Secretary to administer certain congressionally designated National Forest System lands as Wilderness, and tasks managers with protecting natural and unimpaired conditions, allowing exceptions to certain management actions in order to meet the minimum requirements for administration to protect the Wilderness resource (Sections 2c, 4c and 4d). Integrated pest management actions [including aquatic and terrestrial invasive species] in Wilderness are authorized to meet provisions of the Act and be consistent with Forest Service policy and guidance for Wilderness management. None of the alternatives propose the use of actions prohibited in Section 4c of the Wilderness Act.

Executive Order 11593 (Protection and Enhancement of the Cultural Environment)

Directs federal agencies to provide leadership in preserving, restoring and maintaining the historic and cultural environment of the Nation. The work accomplished in accordance with Section 106 of the

National Historic Preservation Act for the Wrangell-Petersburg Weed Management Project meets the intent of this Executive Order.

Executive Order 11988 (Floodplains)

Directs federal agencies to avoid construction in and modification of floodplains. Although this act deals largely with avoiding flood damage and hazards, it also directs agencies to restore and preserve the natural and beneficial values of floodplains while planning for land use. Effects on floodplains from project activities have been avoided or minimized as much as possible through the implementation of BMPs and project design features.

Executive Order 11990 (Wetlands)

Requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands. Because wetlands are so extensive in this project area, it is not feasible to avoid all wetlands. The soils section in Chapter 3 of the EA describes the types and amounts of wetlands in the project area and how they would be affected. Effects to wetlands are minimized through the application of BMPs and implementation of project design features.

Executive Order 12898 (Environmental Justice)

Directs federal agencies to state clearly whether a disproportionately high and adverse human health or environmental impact on minority populations, low-income populations, or Indian tribes is likely to result from the Proposed Action and any alternatives. The Executive Order specifically directs agencies to consider patterns of subsistence hunting and fishing when an agency action may affect fish or wildlife.

In accordance with Executive Order 12898, this project does not have disproportionately high and adverse human health or environmental effects on minority or low income populations.

Executive Order 12962 (Aquatic Systems, Recreation Fisheries)

Requires federal agencies to evaluate the effects of proposed activities on aquatic systems and recreational fisheries. The project minimizes the effects on aquatic systems through project design, application of Standards and Guidelines, best management practices (BMPs), and site-specific mitigation measures. The implementation of weed treatments may result in temporary road closures (24 hours or less) which could limit access to some recreational fishing opportunities by foot or permitted off-highway vehicle. However, most recreational fishing throughout the Tongass occurs by boat in saltwater, and any adverse effects would be minimal.

Executive Order 13112 (Invasive Species)

Section 2 of E.O. 13112 on Invasive Species directs federal agencies to identify actions that may affect the status of invasive species and to take action to:

- Prevent the introduction of invasive species;
- Detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner;
- Monitor invasive species populations accurately and reliably;
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded;

- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and
- Promote public education on invasive species and the means to address them.

Executive Order 13175 (Consultation and Coordination with Indian Tribal Government)

Establishes regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes.

Executive Order 13186 (Migratory Brids)

This EO directs executive departments and agencies to take certain actions to further implement the Migratory Bird Treaty Act.

Required Permits

This project will require a state of Alaska pesticide-use permit, as well as an Alaska Pollution Discharge Elimination System (APDES) permit, in response to the requirements of the Clean Water Act, Section 402 prior to implementing herbicide treatments. Permitting requirements for herbicide application are rigorous and can be reviewed at http://www.dec.state.ak.us/eh/pest/requirements.html. State reporting and monitoring requirements associated with these permits will occur annually.

Distribution

The Wrangell-Petersburg Weed Management Project Decision Notice, FONSI, and EA are available on the internet at http://www.fs.fed.us/nepa/fs-usda-pop.php/?project=37523. Notification of the availability of this Decision Notice was sent to those on the project mailing list including state and federal agencies, anyone commenting on the project, and anyone requesting a copy of this decision. In addition, a legal notice of the availability of this decision was published in the Wrangell Sentinel and Petersburg Pilot.

The project mailing list is available in the project record. The Decision Notice is also available in hard copy or on CD, upon request.

Implementation

If no appeals are filed within the 45-day time period, implementation of the decision may occur on, but not before, the 5th business day following the close of the appeal-filing period. The appeal-filing period begins the day after the publication of this decision's legal notice in the Wrangell Sentinel and Petersburg Pilot.

Administrative Review (Appeal) Opportunities

This decision is subject to administrative review (appeal) pursuant to 36 CFR Part 215. Individuals or non-federal organizations who submit written comments or otherwise express interest in this particular action during the comment period specified at 215.6 have standing to appeal this decision. The notice of appeal must be in writing, meet the appeal content requirements at 215.14 and be filed with the Appeal Deciding Officer:

Forest Supervisor, Forrest Cole
Tongass Supervisors Office, Ketchikan
648 Mission St.
Ketchikan, Alaska 99901
Fax: 907-228-6292
Email: appeals-alaska-tongass@fs.fed.us

The Notice of Appeal, including attachments, must be filed (regular mail, fax, e-mail, express delivery or messenger service) with the Appeal Deciding Officer at the correct location within 45 calendar days of publication of notice of this decision in the Wrangell Sentinel and Petersburg Pilot, the newspapers of record for this project. The publication date in the newspapers of record is the exclusive means for calculating the time to file an appeal.

Appeals submitted electronically, including attachments, must be in an electronic format compatible with Microsoft Word.

Hand-delivered appeals will be accepted at the Ketchikan Supervisors Office during normal business hours (8:00 am through 4:30 pm) Monday through Friday, excluding holidays.

Contact

For additional information concerning this decision or the Forest Service appeal process, contact Carey Case, Petersburg Ranger District, P.O. Box 1328, Petersburg, AK, 99833, 907-772-3871.

Respectfully,

Robert J Dalrymple   7/12/13

ROBERT B. DALRYMPLE   Date
District Ranger
Wrangell Ranger District

JASON C. ANDERSON   Date
District Ranger
Petersburg Ranger District

References

USDA Forest Service. 2013. FSM 2150 Environmental Management. Pesticide-Use Management and Coordination. Washington, DC.

USDA Forest Service. 2008. Tongass Land and Resource Management Plan. Final Environmental Impact Statement - Plan Amendment. Volume 1. R10-MB-603c. Alaskan Region. Juneau, Alaska.

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Wrangell – Petersburg Weed Management Project

Environmental Assessment

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Chapter 1. Purpose and Need for Action

1.1 Introduction

The Forest Service proposes to eradicate, control or contain invasive and other non-native plants (collectively referenced as "weeds" in this document) within the Wrangell and Petersburg Ranger Districts of the Tongass National Forest (Figure 1). Weeds can displace native plant communities and cause long-lasting economic and ecological problems within and outside the National Forest. They can degrade fish and wildlife habitat, out-compete native plants, impair water quality and watershed health, and adversely affect a wide variety of other resource values such as scenic beauty and recreational opportunities. Weeds can spread rapidly across the landscape to all land ownerships.

Invasive plants are defined as "nonnative plants whose introduction does or is likely to cause economic or environmental harm or harm to human health" [Executive Order 13112].

Field inventories have identified 62 different weeds, both invasive and other non-native plant species (approximately 517 acres of infestation), within the boundaries of the 3.6 million-acre project area. Twenty-three of these species, totaling approximately 441 acres, are target weeds, meaning they are the species of greatest concern. Included on the target weed list are common brassbuttons, orange hawkweed, reed canarygrass and Japanese knotweed, among others. The target weeds are the focus of this project since they have been determined to pose a threat to the ecological integrity or desired condition of the sites they occupy (USDA Forest Service 2007). Species on the non-target weed list are not proposed to be targeted specifically, but incidentally when adjacent to target species or present in sensitive areas, such as Wilderness.

Undeveloped lands on the Wrangell and Petersburg Districts have relatively few weeds. Known infestations are primarily in areas that receive high use, such as along roads, at recreation sites and within some riparian areas. Alaska has been relatively insulated from the introduction and subsequent problems that have impacted other states. This is due in part to its remoteness and low population. However, existing infestations of weeds are spreading and new introductions are increasingly being discovered.

The ability to minimize the adverse impacts of weeds is greatest when infestations are treated while they are small and in the early stages of invasion. Benefits of early-stage treatments include reduced treatment costs, greater effectiveness of treatment methods, less chemical use, and less ground and habitat disturbance. In short, there is an opportunity to be proactive with weed management on the Wrangell and Petersburg Ranger Districts by acting now.

By preparing this environmental assessment, the US Forest Service is fulfilling agency policy and direction to comply with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. For more project details see the Proposed Action.

1.2 Where is the proposed project located?

The project area is located on the Wrangell and Petersburg Ranger Districts of the Tongass National Forest (Figure 1).

1.3 Why is this project being proposed?

There is a need to eradicate or control specific weed infestations; provide a mechanism to allow quick detection and rapid response to changing and/or new weed infestations; and protect non-infested areas from future introduction or spread of weeds from existing sites. Weeds are still restricted in extent on the Tongass National Forest (compared to the rest of National Forest System lands in the lower 48 states); therefore, there is an opportunity to proactively limit their growth on the landscape. Most of the known weed infestations occur in developed areas, such as along roadsides and at administrative sites, rock pits and recreation areas. Weeds are also documented in Wilderness areas on both ranger districts.

The purpose of this project is to eradicate or control known weed infestations and treat new infestations, when detected, in an efficient and cost-effective manner that complies with environmental standards. This would move the project area toward the desired future condition stated in the Tongass National Forest Land and Resource Management Plan (2008) on p.2-1:

> "Viable populations of native and desired nonnative species and their habitat are maintained and are not threatened by invasive species…."

Also, the following Forest Plan Goals and Objectives would be addressed:

> Biodiversity Goal (p. 2-4), "Maintain ecosystems capable of supporting the full range of native and desired nonnative species and ecological processes. Maintain a mix of representative habitats at different spatial and temporal scales."
>
> Objective (c), "Manage the Forest in order to reduce, minimize, or eliminate the potential for introduction, establishment, spread, and impact of invasive species."

This project would also work toward maintaining Wilderness quality objectives as per the Forest Plan:

> Wilderness Goal (p. 2-8), "Manage designated Wilderness to maintain an enduring wilderness resource while providing for the public purposes of recreational, scenic, scientific, educational, conservation, and historical use, as provided in the Wilderness Act of 1964 and ANILCA."
>
> Objective, "Preserve and perpetuate biodiversity. Inventory and reduce or eliminate invasive species in Wilderness."

1.4 What is being proposed with this project?

The Proposed Action uses integrated weed management including manual treatments (e.g., hand pulling and tarping), mechanical treatments, and herbicides to eradicate, control or contain populations of weeds on the Wrangell and Petersburg Ranger Districts of the Tongass National Forest. A treatment "cap" of 200 acres per year, with no more than 2,000 acres treated during the 10-year life of the project, is proposed. The acreage caps are not targets; they are part of the project design to limit treatment acres, while allowing for flexibility when faced with unpredictable yearly funding levels, treatment of currently unidentified infestations using the adaptive management tool early detection-rapid response (EDRR), and to account for ongoing treatments needed in areas that have previously received treatment. Newly infested acres, as well as acres of retreatment (typically successful treatment of infestations takes a minimum of two years) would be counted annually.

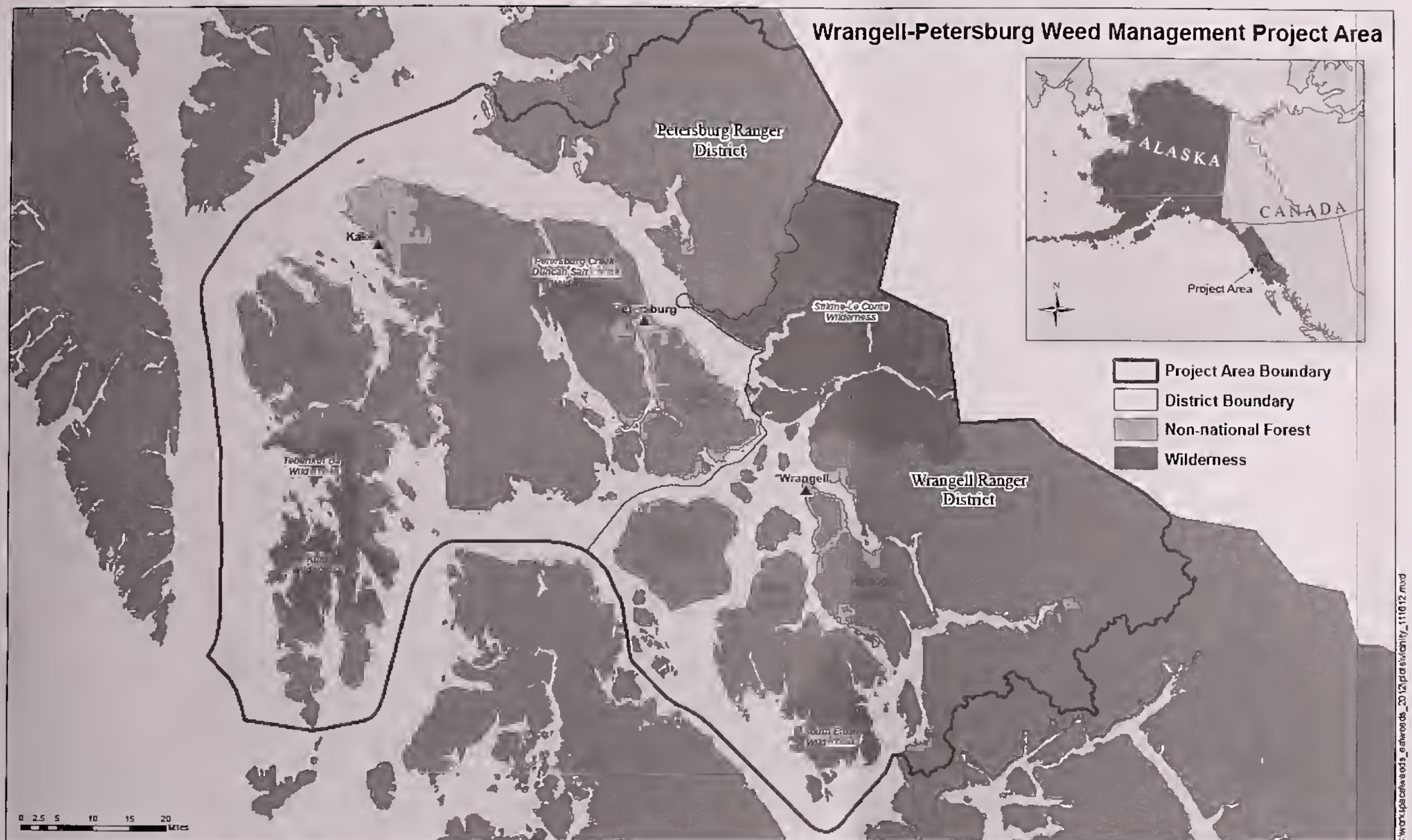

Figure 1. Vicinity map of the project area

Under the ***early detection-rapid response*** approach, new or previously undiscovered infestations would be treated using the same methods proposed for documented infestations.

Prioritization of treatment is proposed to occur annually using a decision framework that provides a consistent process to determine priorities for treatment of target weeds and the selection of treatment methods. For example, some weeds are not considered "highly invasive[1]" (e.g., clover or common plantain) and may only be treated in sensitive areas such as Wilderness; however, when located along a roadside they may be tolerated and not treated at all. Alternatively, other weed species considered "invasive" (e.g., reed canarygrass or orange hawkweed) may be treated while its population is small and manageable in a riparian area, but may be tolerated as a large infestation along a roadside and not treated at all. This flexibility is needed to effectively evaluate the priorities of managing any weed plant population within the project area. This is discussed in more depth in Section 2.3.4.

Site types represent where most known infestations occur, and are typically high-use areas where future infestations are expected (i.e., along roadsides, recreation areas, rock pits, etc.) and are likely locations for vectors to pick up seeds or propagules for transport to other high-use areas.

To help evaluate the effects of the Proposed Action on the natural resources within both ranger districts, weed data (species, location, extent) was organized by 6th Level Hydrologic Units (HUCs) (see Figure 2). At the HUC (i.e., watershed) scale, **site types** have been identified. Site types represent where most known infestations occur, and are typically high-use areas where future infestations are expected (i.e., along roadsides, recreation areas, rock pits, etc.) and are likely locations for seeds or propagules to get picked up and transported to other high-use areas. See Section 2.3.3 for more on HUCs and site types.

Glyphosate, aminopyralid and imazapyr, three herbicides with different chemical properties and modes of action (how the herbicide kills the plant), were selected for this project and are included in the suite of control methods analyzed for this project. Herbicide use is proposed using only ground-based methods, such as spot and selective hand spraying that targets individuals and groups of plants, based on accessibility, topography and size of infestation (*no aerial or broadcast application is proposed*). For more on the proposed application of herbicides, see Chapter 2.

Mulching, seeding and planting of desirable vegetation may occur to restore treated sites. In addition, preventative measures detailed in FSM 2080 Region 10 Tongass National Forest 2000-2007-1 (Noxious Weed Management) would be ongoing and a part of the weed management strategy. Annual monitoring of selected **treatment areas** would evaluate the effectiveness of the treatment method and possibly modify the management strategy, including the method and type of continued or follow-up treatments needed.

Treatment areas are locations selected for treatment in the annual Treatment Plan (see Appendix B). A treatment area may be a distinct area infested with weed species, or an individual plant.

Project design features will be applied during implementation to minimize or eliminate the potential for weed treatments to adversely affect non-target plants, animals, human health, water quality and aquatic organisms.

[1] See the glossary for definitions of "invasive plant", "non-native plant" and "weed."

1.5 Who was consulted for this project?

Public involvement is a key component of the planning process. The following is a summary of the reports, contacts and meetings that have occurred during project planning.

January 1, 2012: Project first listed on the 2nd quarter of the FY 2012 Schedule of Proposed Actions for the Wrangell and Petersburg Ranger Districts.

March 8, 2012: Open house was held at the Petersburg Ranger District. A project poster was on display with a botanist in attendance to answer questions. Fourteen members of the public attended.

April 13, 2012: A scoping package describing the Proposed Action was mailed to 207 individuals and groups seeking comments on the proposed project. Seven responses were received. One included a letter with comments; another provided information about new weed treatment technology. The remaining five respondents either requested to be placed on or removed from the project mailing list.

May 10, 2012: Public notices were published in two local newspapers, the *Wrangell Sentinel* and *Petersburg Pilot* announcing three public meetings for the project to be held in Wrangell, Petersburg and Kake, Alaska.

May 15, 2012: A public meeting was held at the Wrangell Ranger District with a 20 minute presentation to describe the project. The remaining time was available for the public to review maps, the proposed treatment areas and ask questions.

May 16, 2012: A public meeting was held at the Petersburg Ranger District with the same format as the May 15th meeting.

May 17, 2012: A public meeting was held in Kake, Alaska with the same format as the May 15th meeting.

February 27, 2013: Scoping report describing an updated Proposed Action and project description was made available online at http://www.fs.fed.us/nepa/fs-usda-pop.php/?project=37523. Letters providing this link were sent to 209 postal subscribers and 25 email subscribers. Two responses were received, one during the comment period.

1.6 What issues have been identified?

The following issues were identified either from internal or external comments during the scoping period:

- Herbicide toxicology/herbicide use (particularly glyphosate)
- Herbicide impacts on non-target vegetation
- Herbicide impacts on soils
- Herbicide impacts on water/aquatic organisms
- Herbicide impacts on wildlife
- Treatment costs

- Effects to Wilderness area characteristics from manual, mechanical and chemical treatments

1.6.1 Herbicide Toxicology/Herbicide Use

Issue Statement: Herbicides can be toxic to people either when exposed in a long-term scenario or in a short-term situation.

Background: This issue speaks to general concern about herbicides and the risks to people from proposed herbicide use. Risk assessments have been prepared for Region 6 of the US Forest Service (Washington and Oregon). These USDA Forest Service documents were consulted for this analysis since coastal Washington and Oregon have similar environments to Southeast Alaska. These risk assessments were interpreted in a conservative manner, meaning that the threshold of concern for people is set very low. For the most part, by following the Alaska State standards for herbicide use, herbicide label directions, risk assessment guidance, and implementing project design features developed for this project, herbicide use would not result in exposures above the conservative thresholds of concern.

Issue Measures:

- Type (chemical properties) and extent (rate and method of application) of herbicide use that could result in harmful exposure scenarios to people in both long-term and short-term scenarios.
- Qualitative assessment of the effectiveness of project design features to prevent harmful herbicide exposure scenarios.

1.6.2 Herbicide Impacts on Non-target Vegetation

Issue Statement: Proposed herbicide use may harm non-target plants, specifically sensitive and other special status species and cultural/traditional use plants.

Background: Herbicides are designed to kill plants and there is always a risk that herbicide will affect non-target botanical forms (vascular and non-vascular plants such as fungi, algae, lichens, bryophytes, liverworts). The presence of special status species, treatment extent, rate and method of application, and the properties of the chemicals proposed influence the degree of risk.

Issue Measure:

- Qualitative assessment about the effectiveness of buffers and other project design features to prevent herbicide from harming non-target botanical species and pollinators.

1.6.3 Herbicide Impacts on Soils

Issue Statement: Herbicides may accumulate in soils and harm soil biota, which perform nutrient cycling functions necessary for decomposition and soil productivity.

Background: The three herbicides proposed for this project (i.e., aminopyralid, glyphosate, imazapyr) are not known to have long persistence in the soil (as compared to other herbicides such as picloram and sulfometuron methyl); however any possible affect to the soil biota needs to be examined. Project design features have been developed to minimize the potential for accumulation of herbicides in soil.

Issue Measures:

- Quantitative assessment of the level of herbicide application to prevent any adverse effect to soil biota.
- Qualitative assessment of herbicide treatments based on the particular characteristics of the chemical used, how it is applied, and the soil's physical, chemical, and biological condition.

1.6.4 Herbicide Impacts on Water and Aquatic Organisms

Issue Statement: Proposed herbicide use may result in chemicals reaching streams and other water bodies (through drift, leaching or run off) and adversely affect aquatic organisms and water quality.

Background: There are no listed threatened or endangered fish and amphibian species on the Tongass National Forest. The Proposed Action will minimize potential for herbicide delivery to surface waters and wetlands. Proposed herbicide use will not contaminate drinking water and water quality standards will be met. However, the risk that some chemicals may reach surface waters and adversely affect aquatic organisms cannot be eliminated. Treatment extent, rate and method of application and the properties of the chemicals proposed influence the degree of risk.

Issue Measures:

- Type and extent of herbicide use within aquatic influence zones (areas where herbicide use has potential to reach streams) and other water bodies; riparian areas and road drainage networks near streams.
- Potential for harm to fish and amphibians.

1.6.5 Herbicide Impacts on Wildlife

Issue Statement: Proposed herbicide use may result in harmful exposure to wildlife.

Background: There are no listed threatened or endangered animal species on the Tongass National Forest. As stated above, the Proposed Action will minimize potential for herbicide delivery to surface waters and wetlands. Proposed herbicide use will not contaminate drinking water and water quality standards will be met. However, the risk that some chemicals may reach surface waters cannot be eliminated. Wildlife consuming non-target vegetation that has inadvertently been treated with herbicides is unlikely; however, to mitigate concerns of reaching acute toxicity levels, glyphosate will be applied at a rate below its upper limit (7 pounds of acid equivalent/acre [lb a.e./acre]). Treatment extent, rate and method of application and the properties of the chemicals proposed influence the degree of risk.

Issue Measures:

- Type and extent of herbicide use within specific wildlife habitats.
- Risk of herbicide contamination and effects on eggs.
- Potential for harm to sensitive status wildlife species.

1.6.6 Treatment Costs

Issue Statement: Integrated weed treatments need to be timely and cost-effective, and result in the desired treatment strategy for the particular infestation being treated (i.e., containment, control or eradication).

Background: Treatment costs and potential need for re-treatment are directly affected by the range of effective treatments for any given site. Increased costs and reduced effectiveness reduce the acreage that can be effectively treated with limited funding.

Issue Measures:

- Time and cost to treat the target weeds by general treatment method (herbicide or manual/mechanical).
- Effectiveness by general treatment method.

1.6.7 Effects to Wilderness Area Characteristics from Manual, Mechanical and Chemical Treatments

Issue Statement: There may be a negative impact to Wilderness character from the various kinds of treatments proposed (i.e., manual, mechanical and chemical).

Background: There are five Wilderness areas within the project areas, including the Stikine-LeConte, South Etolin, Tebenkof Bay, Kuiu, and Petersburg Creek-Duncan Salt Chuck Wildernesses. Manual, mechanical and chemical treatments are proposed within those areas.

Issue Measures:

- A qualitative narrative of the short-term and long-term direct, indirect and cumulative effects on weeds within the Wilderness if manual, mechanical and chemical tools are available for use.
- A qualitative discussion about the direct, indirect and cumulative effects of using manual, mechanical and chemical tools on Wilderness character as defined by federal regulation (i.e., trammeling, etc.).
- Analysis of how long will it take to treat a site for known infestations using each treatment method as a measure of impacts to Wilderness character over time.

1.7 Federal and State Permits, Licenses and Certifications

Prior to implementation of weed treatments, two permits are required from state agencies.

- A State of Alaska pesticide-use permit and an Alaska Pollution Discharge Elimination System (APDES) permit are required in response to the requirements of the Clean Water Act, Section 402. Permitting requirements for herbicide application are rigorous and can be reviewed at http://www.dec.state.ak.us/eh/pest/requirements.html. State reporting and monitoring requirements associated with these permits will occur annually.

1.8 Applicable Laws and Executive Orders

Shown below is a partial list of federal laws and executive orders pertaining to project-specific planning and environmental analysis on federal lands. While more pertain to federal lands, some of the laws are specific to Alaska. Disclosures and findings required by these laws and orders will be within the Decision Notice for this EA.

- Alaska Drinking Water Regulations (18 AAC 80)
- Alaska National Interest Lands Conservation Act of 1980
- Alaska Water Quality Standards (18 AAC 70)
- Bald and Golden Eagle Protection Act of 1940 (as amended)
- Clean Water Act of 1977 (as amended)
- Endangered Species Act (ESA) of 1973 (as amended)
- Federal Cave Resources Protection Act
- Federal Insecticide, Fungicide and Rodenticide Act
- Magnuson-Stevens Fishery Conservation Act of 1996
- Marine Mammal Protection Act of 1972
- Migratory Bird Treaty Act of 1918 (as amended)
- Multiple-Use Sustained-Yield Act of 1960
- National Forest Management Act of 1976 (as amended)
- National Historic Preservation Act of 1966
- National Invasive Species Act of 1996
- Noxious Weed Control and Eradication Act of 2004
- Plant Protection Act of 2000 (as amended)
- Wilderness Act of 1964
- Executive Order 11593 (Protection and Enhancement of the Cultural Environment)
- Executive Order 11988 (Floodplains)
- Executive Order 11990 (Wetlands)
- Executive Order 12898 (Environmental Justice)
- Executive Order 12962 (Aquatic Systems, Recreation Fisheries)
- Executive Order 13112 (Invasive Species)

- Executive Order 13175 (Consultation and Coordination with Indian Tribal Government)
- Executive Order 13186 (Migratory Birds)

Chapter 2. Alternatives

This chapter describes the alternatives considered to achieve the purpose and need discussed in Chapter 1. Alternative 1 is the No Action; Alternative 2 is the Proposed Action; and Alternative 3 was developed in response to the issues identified during scoping and noted above (i.e., herbicide toxicity). In addition, project design features (protection measures) are incorporated into the alternative descriptions and are included in this chapter. The intent of these measures is to decrease potential adverse effects to people and the environment. A table at the end of the chapter presents the alternatives in comparative form, defining the differences and providing the decision makers a basis for selecting an alternative.

2.1 How were the alternatives developed?

Following the initial scoping in the spring of 2012, the interdisciplinary team (IDT) modified the Proposed Action (Alternative 2) in an effort to better implement early detection-rapid response (EDRR). The IDT also chose to include the entire project area in the treatment analysis area (approximately 3.6 million acres) rather than the specific treatment areas described in 2012's scoping report (31,300 acres). This increased area would not limit treatment to only high use areas and/or those areas where weeds are currently documented, but would allow for treatment anywhere weed populations were found during the lifespan of the project.

Another change was an increase in the maximum number of acres proposed for treatment to 200 acres/year or 2,000 acres over the 10-year life of the project (up from 60 acres/year; 600 acres total). Reasons for this change were to address the concern that the ranger districts may miss out on unexpected funds for weed treatments if the treatment acre cap is too small, and increasing the yearly cap provides more flexibility in the year-to-year management of weeds.

The initial species list for treatment was also expanded to include more non-native species currently found within the project area. This will allow managers to respond to populations that may not be considered highly invasive, but are found in sensitive areas such as Wilderness.

Public comments also suggested that herbicide use should be severely minimized or eliminated altogether. The No Action Alternative responds to this concern by allowing no treatment outside of what can be approved through Categorical Exclusions, which is very similar to a "no-herbicide" alternative.

Alternative 3 was also developed to address public concerns about herbicide use by eliminating herbicide use as a treatment option. Both the no action and Alternative 3 rely predominately on manual and mechanical treatments. The impacts and effectiveness of such treatments are discussed in Chapter 3.

2.2 What would it mean to not meet the need?

2.2.1 Alternative 1 (No Action)

Under the No Action Alternative, the activities proposed in the action alternatives would not be implemented. The No Action Alternative, however, would not preclude future weed management

in the project area. This alternative represents the existing condition and expected future conditions (in the absence of treatments proposed in this project) and serves as a baseline to compare the effects between alternatives.

If an action alternative is not selected, the continued use of district-level categorical exclusions (CEs) is anticipated to allow chemical, manual and mechanical treatment at developed sites, and manual and mechanical use in other areas. For a summary of past weed control work within the project area, see the weeds effects analysis in Chapter 3.

Existing Condition

Undeveloped lands on the Wrangell and Petersburg Districts are relatively free from invasive plants. Known infestations are primarily in areas that receive high use, such as along roads, at recreation sites, and within some riparian areas.

Field inventories have identified 62 different weeds, both invasive and other non-native plant species (approximately 517 acres of infestation), within the boundaries of the project area. Twenty-three of these species, approximately 441 acres of infestation, are targeted for integrated weed management (hereafter referred to as "target species") (see Table 1). The weeds of greatest concern include common brassbuttons, orange hawkweed, reed canarygrass and Japanese knotweed, among others.

To read more about previous treatments refer to the Current Weed Inventory section in Chapter 3.

Table 1. Non-native target species list. This list includes the species the action alternatives propose to treat. They pose a threat to the ecological integrity or desired condition of the sites they occupy.

Scientific name	Common name	Invasive ranking[1]	Estimated acres in the project area[2]
Centaurea stoebe ssp. *micranthos*	spotted knapweed	86	0.1
Cirsium vulgare	bull thistle	61	5.0
Cotula coronopifolia	common brassbuttons	42	104.6
Crepis tectorum	narrowleaf hawksbeard	56	< 0.1
Digitalis purpurea	purple foxglove	51	0.2
Hieracium aurantiacum	orange hawkweed	79	4.2
Hieracium murorum	wall hawkweed	NR[3]	31.9
Hypericum perforatum	common St. Johnswort	52	< 0.1
Hypochaeris radicata	hairy cat's ear	44	3.2
Leucanthemum vulgare	oxeye daisy	61	3.5
Lotus corniculatus	bird's-foot trefoil	65	0.4
Melilotus officinalis	sweetclover	69	3.7
Phalaris arundinacea	reed canarygrass	83	167.7
Plantago major	common plantain	44	30.9
Polygonum cuspidatum	Japanese knotweed	87	3.3
Ranunculus acris	tall buttercup	54	< 0.1
Ranunculus repens	creeping buttercup	54	14.9
Sorbus aucuparia	European mountain ash	59	< 0.1
Tanacetum vulgare	common tansy	60	0.1

Scientific name	Common name	Invasive ranking[1]	Estimated acres in the project area[2]
Taraxacum officinale	common dandelion	58	35.0
Trifolium hybridum	alsike clover	57	7.3
Trifolium pratense	red clover	53	0.6
Trifolium repens	white clover	59	24.5
Total acres of target species			**441**

[1] Alaska Natural Heritage Program's (ANHP) ranking of 0 indicates the lowest risk for ecological harm and 100 indicates the highest risk. When determining the target species for treatment, the invasiveness ranking plays an important role in the treatment strategy. The higher the invasive ranking for the species, the greater risk for continued spread. Ranking results are from: http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm.

[2] Acres of infestation have been rounded which accounts for the slight discrepancy in total acres.

[3] Not ranked by Alaska Natural Heritage Program

Expected Future Conditions

Existing infestations of weeds are spreading and new introductions are increasingly being discovered. Expansion of weed populations varies depending on species, whether pathways for spread are near existing infestations (e.g., roads, trails, flowing water) and the amount of existing disturbance. Based on data from the Pacific Northwest, weed expansion occurs at an annual rate of 1 to 5 percent for infestations not actively being treated, but expansion rates can be as high as 15 percent (Asher and Dewey 2005). For the purpose of this analysis, an expansion rate of 10 percent is estimated if there is no future weed management in the project area.

2.3 What are the alternatives proposed to meet the need?

2.3.1 Alternative 2 (Proposed Action) – Integrated Weed Management, Including Herbicides

This alternative proposes an integrated pest management approach, using all available treatment methods (manual, mechanical and chemical) in combination with an early detection and rapid response (EDRR) system of treatment within the project area. It is designed to provide a 10-year framework for decision making with treatment strategies for existing and new infestations. From this framework, site-specific treatment prescriptions are proposed for priority infestations on an annual basis. Site-specific prescriptions include the eradication, control or containment of existing and new infestations of target weed species.

The number of entries into the same area would vary by weed species. Some species would likely need multiple treatments in one growing season, such as the larger sized weeds with large root/rhizome structures (e.g., Japanese knotweed and reed canarygrass).

The number of acres proposed for treatment within the project area is based on the current inventory of weeds on both ranger districts, which totals about 517 acres (for a breakdown of all the acres and species, see Appendix A). Though many of these populations are important to treat, the sheer number and distribution of sites, coupled with yearly funding fluctuations make priority-setting a difficult task. For this reason, specific infestations selected for treatment will be analyzed yearly through an implementation planning process (described in Section 2.4.4) and are not included as a NEPA decision. An annual treatment plan will be required to determine the program of work each year (see Appendix B for the treatment plan).

2.3.2 Alternative 3 – Integrated Weed Management without Herbicides

Alternative 3 was developed in response to a comment received during scoping. The individual is concerned that herbicides could have an adverse effect on aquatic organisms, humans and animals. The alternative is being considered in detail because it is a reasonable alternative to the Proposed Action, could possibly fulfill the purpose and need (dependent on staffing and funding) and addresses unresolved conflicts related to the Proposed Action. This alternative is the same as Alternative 2, the Proposed Action, other than it removes herbicides as an option for treatment.

Without herbicide as a treatment option, more emphasis would be placed on using hand pulling and mechanical tools. Some of the most difficult weeds to treat without herbicides would likely be reed canarygrass, Japanese knotweed, bull thistle, brassbuttons and orange hawkweed, and return treatments could be for the life of the project and beyond. Some weed areas would likely need to be treated annually and would not likely be eradicated (e.g., brassbuttons, orange hawkweed, Japanese knotweed). This alternative would likely result in the control rather than eradication of weed species in the project area and would require more monitoring and restoration activities than Alternative 2.

This alternative would require more entries over the long-term to control target weed species. It would also require more work-hours to complete the work in a given area when compared to the use of herbicides. Due to the additional work likely to be required in treating the target weeds (i.e., brassbuttons, Japanese knotweed, reed canarygrass, various hawkweeds), the non-target species and those proposed for treatment using EDRR may receive little or no treatment. In addition, not using herbicides could be less effective. The number of acres treated would likely be below the 200 acre/year treatment cap.

2.4 What are the project design elements for the action alternatives?

2.4.1 Treatment Caps

Treatments using mechanical, manual and chemical methods on the Petersburg and Wrangell Ranger Districts would not exceed 200 acres per year or 2,000 acres during the life of the project. These acreage caps are not targets and have been incorporated into the project design to limit treatment acres; to allow flexibility when faced with unpredictable funding levels; to use the early detection-rapid response (EDRR) approach to treat future infestations; and to account for ongoing treatments needed in areas that are currently being treated. New acres, as well as retreated acres, will be tallied together annually.

Defining an acreage "cap" allows the analysis in the EA to proceed within maximum, well-defined parameters. It also provides useful information about the potential extent of proposed treatments, including those implemented through EDRR. It is expected that acres treated annually would be substantially less than 200 acres, considering limited budgets and recent treatment history.

2.4.2 Early Detection-Rapid Response

Early detection-rapid response (EDRR) is an adaptive management tool included in this analysis to address ever-changing weed infestations, and allow district staff to respond to the discovery of new or previously undiscovered infestations within the project area. Early detection and rapid

containment of target weeds is the most efficient method for controlling their spread in terms of time and money.

Under the EDRR approach, new or previously undiscovered infestations would be treated using the range of methods described in this EA and according to the project-specific project design features (PDFs). The ever-changing distribution of weeds makes this a necessary component of the ranger districts' treatment program.

This analysis assumes that new infestations will be similar (in size, species, and site type location) to current infestations. For instance, the majority of weed sites occur in highly disturbed habitats, such as along roads (including rock pits and stream crossings), and it is expected that will be the case in the future. It is also assumed that undocumented infestations would respond similarly to documented infestations within the same site type.

2.4.3 Areas of Analysis

6th Level HUC

To help evaluate the effects of the Proposed Action on the natural resources within both ranger districts, weed data (species, location, extent) is organized by 6th Level Hydrologic Units (HUCs) (see Figure 2). HUCs are unique identifiers used in a standardized watershed classification system developed by the US Geological Survey (USGS) and are organized in a nested hierarchy by size from the largest (regions) to the smallest (cataloging units). A HUC is the "address" of a particular watershed. Watersheds are spatially located landscape features uniformly mapped for the entire United States at multiple scales. The 6th level HUC is the scale commonly used to determine the potential effects of management activities, rather than processes or functions of ecosystems (Regional Ecosystem Office 1995). It is helpful in this analysis for determining potential cumulative impacts for weed management; in particular, limits on the rate and exposure of herbicides within a stream network.

Two hundred twenty-three 6th level HUC watersheds occur within the project area. Fifty-nine of these watersheds have known populations of weeds. One percent or less of the area in any of these 57 watersheds contains weeds, and most (42) of these watersheds contain less than 20 acres of weed populations (Table 2).

Table 2. Ten HUCs in the project area with the highest documented acreages of weed infestations. Table includes acres of infestation, size of the HUC in acres and the percentage of the watershed infested.

HUC name	Size of HUC (acres)	Acres infested	Percentage infested
North Arm Duncan Canal-Frontal Duncan Canal	30,731	104.5	0.3
Colorado Creek-Frontal Wrangell Narrows	48,264	78.6	0.2
Sunrise Lake-Frontal Sumner Strait	5,954	61.6	1.0
Pat Creek-Frontal Zimovia Strait	62,732	49.1	0.1
Stikine River-Frontal Stikine Strait	49,577	41.9	0.1
Mitkof Island-Frontal Frederick Sound	19,727	39.2	0.2
Anita Bay-Frontal Zimovia Strait	17,313	38.4	0.2
Wrangell Island-Frontal Eastern Passage	18,122	36.1	0.2
190102090201-Helen Peak	7,198	31.9	0.4
Keku Strait-Frontal Frederick Sound	25,195	24.7	0.1

Site Types

Site types have been identified within each HUC and represent areas where weed species are most commonly found (Table 3). Site types also have varying degrees of weed movement pathways and/or sources of material that can lead to future infestations. For example, timber harvest, road building, and other ground-disturbing activities routinely contribute to the spread of weeds, due to habitat conditions that facilitate colonization, namely mineral soil exposure and increased sunlight.

Table 3. Acres of inventoried target species in the project area by site type and common pathways of spread.

Site type	Common pathways of spread	Infested area of each site type[1] (acres)	Percent (%) infested by site type
Roadside	Vehicles and road maintenance actions	309	0.01
Administrative sites, campgrounds, cabins	Recreation users, visitors, Forest employees	115	< 0.01
Wetlands	Water	280	< 0.01
Trails (including trailheads)	Recreation users, vehicles at trailhead parking areas	5	< 0.01
Forest	Logging activity	395	0.1
Marine Access Facilities Rock pits	Vehicles and dispersed material from infested areas	33 32	< 0.01 < 0.01
Streams and floodplains	Water, mineral soil exposure	235	< 0.01
Stream crossings	Vehicles and road maintenance actions; water, mineral soil exposure	153	< 0.01
Estuaries	Water, mineral soil exposure	107	< 0.01

[1]The sum of site type acres infested is greater than the documented acres infested. This is due to infested acres occurring, and being counted, in more than one site type.

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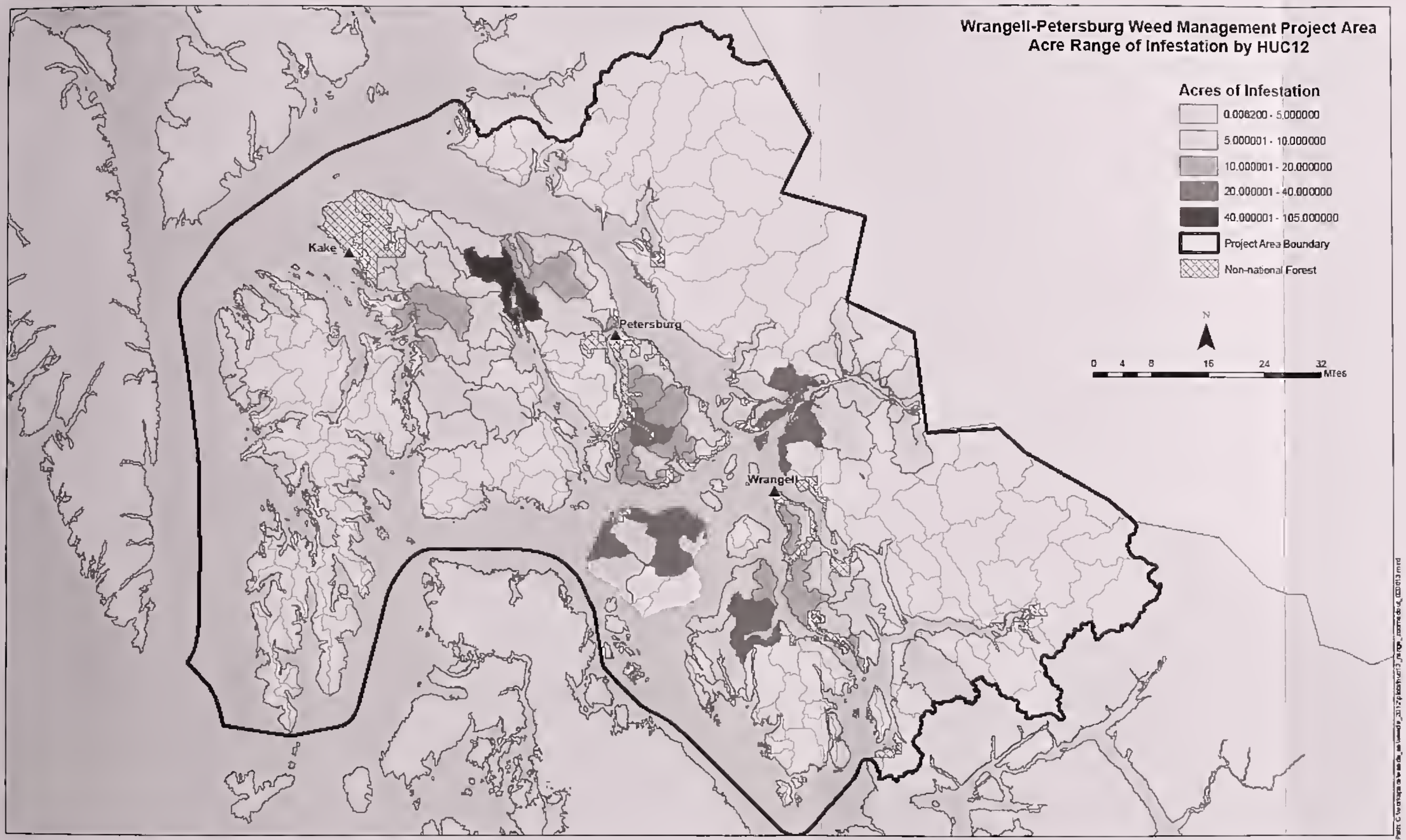

Figure 2. Map shows HUCs within the project area with documented weed infestations. The majority of HUCs with weeds have less than 20 acres of weeds inventoried.

Table 4. Acres of inventoried non-target species in the project area by site type and common pathways of spread.

Site type	Common pathways of spread	Area of each site type[1] (acres)	Percent (%) infested by site type
Roadside	Vehicles and road maintenance actions	73.3	< 0.01
Administrative sites, campgrounds, cabins	Recreation users, visitors, Forest employees	0.9	< 0.01
Wetlands	Water	32.95	< 0.01
Trails (including trailheads)	Recreation users, vehicles at trailhead parking areas	0.01	< 0.01
Forests	Logging activity	74.47	< 0.01
Marine Access Facilities Rock pits	Vehicles and dispersed material from infested areas	3.9 5.0	< 0.01 <0.01
Streams and floodplains	Water, mineral soil exposure	12.38	< 0.01
Stream crossings	Vehicles and road maintenance actions; water, mineral soil exposure	7.32	< 0.01
Estuaries	Water, mineral soil exposure	0.72	< 0.01

[1]The sum of site type acres infested is greater than the documented acres infested. This is due to infested acres occurring, and being counted, in more than one site type.

Roadsides

Roads are conduits for the spread of weeds, providing transport and dispersal (e.g., seeds and vegetative reproductive parts attached to vehicles) and disturbed ground for easy colonization and establishment. Roads serve to introduce and establish weeds in areas where they were previously unknown. Roadside infestations occur along the disturbed right-of-way, typically from the edge of the road prism to about 25 feet beyond. Weeds typically get shaded out by native vegetation as the amount of soil disturbance decreases and forest canopy increases. Infestations may move from the road right-of-way to stream corridors (at stream crossings) in certain locations.

Weeds within 100 feet of a road were included in the infested acres calculation for this site type

Administrative Sites, Campgrounds, Cabins

Administrative sites, campgrounds, and cabins are all developed sites with altered vegetation and structures present. The disturbed soil and open areas are ideal growing conditions for weeds. In addition to hardened areas (gravel or planking) there is often continual trampling at these sites. This can favor weed species which are often hardier than the native species. People, vehicles and pets can all provide pathways for weed seed dispersal into and out of the sites.

Weeds within 600 feet of an administrative site, campground or cabin were included in the infested acres calculation for this site type.

Wetlands

Wetlands are defined as "those areas that are inundated or saturated by surface water or groundwater with a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions" (40

CFR 230.41 (a) (1). There are also 3 criteria used to determine whether a site is a wetland or not: vegetation, soils and hydrology. Wetlands make up a large percentage of the project area (approximately 29 percent).

Within this project area, 96 percent of the wetland types are classified as Palustrine – freshwater wetlands, and water bodies. Lacustrine (lake) systems make up about 2 percent of the wetland area. The remaining 2 percent are primarily classified as Riverine – fresh, flowing water contained within a channel and estuarine along the shoreline.

Weed acres within the wetlands site type were determined by the National Wetland Index (NWI) layer in GIS.

Trails

A trail is defined as a route 50 inches or less in width, or a route over 50 inches wide that is identified and managed as a trail (36 CFR 212.1). Weeds within 10 feet of a developed trail were included in the infested acres calculation for this site type.

Forests

Forests, both old-growth and young-growth, usually have fairly intact soils (not recently disturbed) with existing forb and shrub layers along with partial-to-full shade from the tree canopy. These sites are generally not as susceptible to weeds because most species need the conditions of disturbed soil and sun exposure to become established.

Weeds within the Forested cover type layer in GIS were included in the infested acres calculation for this site type.

Marine Access Facilities and Rock Pits

Marine access facilities (MAFs) and rock pits have had major vegetation removal and alteration. They are generally exposed sites (open to sun) with disturbed soils which make ideal growing conditions for many weed species. Heavy equipment is often used at these sites and can spread seeds and propagules of weeds to previously non-infested areas. New rock pits may become infested with weeds from the adjacent roadsides. These species can then be spread to new areas if the rock or gravel is moved to previously non-infested areas.

Weeds within 200 feet of an MAF and/or within 250 feet of a rock pit were included in the infested acres calculation for this site type.

Streams and Floodplains

The project area is comprised of a myriad of streams and several rivers, all with differing characteristics. Stream channels are categorized by class (I, II, III, IV) in the 2008 Tongass Land and Resource Management Plan and FSH 2090.21 (USDA Forest Service 2001a), Chapter 10, Section 12 based on their fish production values. In addition to stream class categorization, streams are categorized into channel types, which are grouped into nine process groups, or combinations of similar channel types based on major differences in landform, gradient, and channel shapes (USDA Forest Service 1992, updated 2010). These are used to assess watershed conditions, sensitivity to management activities, and fish habitat production capabilities.

A floodplain is defined as the surface or strip of relatively smooth land adjacent to a river (and sometimes stream) channel, constructed by the present river/stream in its existing regimen and covered with water when the river/stream overflows its banks. It is built of alluvium carried by

the river/stream during floods and deposited in the sluggish water (including any weed materials it may be carrying) beyond the influence of the swiftest current. A river/stream has one floodplain and may have one or more terraces representing abandoned floodplains. Within the project area, the Stikine River is the dominant floodplain; however other floodplains exist, including Bradfield River, Farragut River and Petersburg Creek.

The importance of streams and floodplains as site types is based on the potential adverse impacts weed infestations may have on the terrestrial and aquatic functions of these landforms, as well as the role these landforms play as conduits for weed spread across the project area. Water movements within streams and floodplains serve as a major **vector** for moving weed seed and other plant materials from currently infested areas to non-infested areas.

Weed infestations within the riparian management area (RMA) layer in GIS were included in the infested acres calculation for this site type.

Stream Crossings

Proximity to road crossings of streams is one of the primary determinants of exposure to herbicide properties, with the most significant exposure occurring at or near confluences with perennial streams (USDC National Marine Fisheries Service 2007). Because these locations represent points of likely encroachment into riparian areas, the number of stream crossings within a watershed can help assess risk of spread.

Infestations of targeted weed species within 30 feet of culverts were assessed during roadside surveys and included in the infested acres calculation for this site type.

Vectors are pathways of spread. Common vectors for weeds are water, wind, people, animals and vehicles.

Estuaries

Most estuaries in Southeast Alaska are considered wetlands due to the combination of saturated soils and the dominance of hydrophytic vegetation. Estuarine wetlands consist of deep water tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land and have open, partly obstructed or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The limits of the estuarine wetlands extend upstream and landward where ocean-derived saltwater mixes to a significant level with freshwater. The estuarine system includes both estuaries and lagoons. It is more strongly associated with land than is the marine wetland system. In terms of wave action, estuaries are generally considered to be low-energy systems (Cowardin et al. 1979). Estuaries are biologically significant due to their extremely high habitat value for fish and wildlife.

Weed infestations within the National Wetland Inventory layer in GIS were included in the infested acres calculation for this site type.

2.4.4 Weed Treatment Priority and Decision Making Strategy

The following is an outline of the process to properly implement the selected alternative. It applies to all target weed species and site types analyzed for treatment in this EA, as well as new populations found during inventory, where EDRR is proposed. Annually, program managers for each ranger district will identify sites for potential treatment and develop a treatment plan (see Appendix B). The following strategy will help ensure the chosen sites are within the treatment bounds analyzed within this EA.

Strategy Objectives and Priorities

To develop a comprehensive weed treatment strategy, three prerequisite pieces of information must be evaluated:

1. what to treat: selection of the highest priority infestations;
2. where to treat: target locations; and
3. management objective for the site.

Using these 3 criteria, this section delineates the information that will be considered for developing annual treatment plans for target weeds in the project area.

Criteria for Determining Highest Priority Infestations

Several factors are used to identify the highest priority species for control. These include the target (Table 1), non-target (Table 5) and watch list (Table 6) species. Coupled with other information, such as size of infestation and threat to resource values, and desired conditions for the land use area, some of these high-priority species are identified for immediate control measures.

- Species currently on the State of Alaska list of prohibited and restricted noxious weeds
- Species currently on the Tongass National Forest High Priority Invasive Plant Species List (FSM 2000 - Chapter 2080 [USDA Forest Service 2007])
- Species with high invasiveness rankings - Alaska Natural Heritage Program's Weed Ranking Project, http://aknhp.uaa.alaska.edu/botany/akepic/non-native-plants-alaska
- Burgeoning infestations

Criterion 1: What to Treat – Target Species and Invasiveness Ranking

The target species list (see Table 1) identifies the weed species proposed for treatment. In some areas it may be desirable to treat all non-native plants (i.e., including non-target species) which include those listed in Table 5. Additionally, a watch list (Table 6) identifies highly invasive plants not currently known to occur on the National Forest System (NFS) lands within the project area, but would be treated if found.

Criterion 1 of the weed treatment strategy includes the analysis of three species lists:

- Non-native Target Species List – species targeted for treatment. These include invasive species and other non-native species located in sensitive habitats or LUDs (Table 1).
- Non-native Other Species List – species not intended for treatment, except as incidental when they are associated with target species. These species are typically non-invasive (Table 5).
- Noxious and Invasive Species Watch List – species currently undocumented in the project area and classified as noxious and/or invasive. If these species are found, they would be treated quickly using the EDRR strategy (Table 6).

The Alaska Natural Heritage Program has developed an evaluation tool to rank the expected invasiveness of non-native species in Alaska (see Tables 1, 5 and 6). The process uses a numerical

ranking system from 0 to 100. A ranking of 0 indicates the lowest risk for ecological harm and 100 indicates the highest risk. When determining the target species for treatment, the invasiveness ranking plays an important role in the treatment strategy. The higher the invasive ranking for the species, the greater risk for continued spread.

Table 5. Non-native other species list. These species are not proposed to be targeted specifically, but would be treated incidentally when associated with target species or in sensitive areas.

Scientific name	Common name	Invasive ranking[1]	Estimated acres in the project area[2]
Achillea ptarmica	sneezeweed	46	< 0.1
Agrostis capillaris	colonial bentgrass	NR[3]	0.1
Agrostis gigantean	redtop	NR[3]	< 0.1
Agrostis stolonifera	creeping bentgrass	NR[3]	< 0.1
Alopecurus geniculatus	water foxtail	49	< 0.1
Alopecurus pratensis	meadow foxtail	52	< 0.1
Anthemis cotula	stinking chamomile	41	< 0.1
Anthoxanthum odoratum	sweet vernalgrass	NR[3]	< 0.1
Bromus inermis ssp. inermis	smooth brome	62	0.3
Cerastium fontanum	common mouse-ear chickweed	36	10.7
Dactylis glomerata	orchardgrass	53	1.5
Deschampsia elongata	slender hairgrass	35	0.1
Euphrasia nemorosa	common eyebright	42	< 0.1
Fragaria ananassa	strawberry	NR[3]	< 0.1
Gnaphalium palustre	western marsh cudweed	NR[3]	< 0.1
Hordeum jubatum	foxtail barley	63	< 0.1
Holcus lanatus	common velvetgrass	56	1.0
Iris pseudacorus	Pale yellow iris	66	< 0.1
Lolium perenne ssp. *multiflorum*	Italian ryegrass	41	0.5
Lolium perenne ssp. *perenne*	perennial ryegrass	52	0.2
Lotus pedunculatus	big trefoil	NR[3]	< 0.1
Lupinus polyphyllus ssp. *polyphyllus* var. *polyphyllus*	bigleaf lupine	71	0.1
Matricaria discoidea	disc mayweed	32	0.5
Medicago lupulina	black medick	48	< 0.1
Mycelis muralis	wall-lettuce	31	10.1
Myosotis scorpioides	true forget-me-not	54	0.4
Phalaris canariensis	annual canarygrass	NR[3]	0.4
Phleum pretense	timothy	54	30.7
Poa annua	annual bluegrass	46	9.4
Poa compressa	Canada bluegrass	39	0.5
Poa pratensis	Kentucky bluegrass	52	1.7

Scientific name	Common name	Invasive ranking[1]	Estimated acres in the project area[2]
Poa trivialis	rough bluegrass	52	0.2
Rumex acetosella	common sheep sorrel	51	0.5
Rumex crispus	curly dock	48	< 0.1
Sagina procumbens	birdeye pearlwort	39	< 0.1
Schedonorus phoenix	tall fescue	63	6.0
Stellaria media	common chickweed	42	< 0.1
Triticum aestivum	common wheat	NR[3]	< 0.1
Veronica serpyllifolia ssp. *serpyllifolia*	thymeleaf speedwell	36	0.4
Total acres of non-target species			**75.7**

[1] Alaska Natural Heritage Program's (ANHP) Weed Ranking Project results were used (http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm)

[2] Acres of infestation have been rounded which accounts for the slight discrepancy in total acres.

[3] Not ranked by Alaska Natural Heritage Program

Table 6. Noxious and invasive species watch list. These species are currently not documented on National Forest System lands within the project area and are classified as noxious and/or invasive. If these species are found on NFS lands, they would be treated using the EDRR strategy.

Scientific name	Common name	Invasive ranking 0-100 (low-high)[1]
Alchemilla monticola	hairy lady's mantle	56
Alliara petiolata	garlic mustard	70
Brachypodium sylvaticum	false-brome	70
Cardaria drabe, c. pubescens, Lepidium latifolium	whitetop and its varieties	71
Carduus nutans, C. acanthoides, C. pycnocephalus , C. tenuiflorus	musk thistle, plumeless thistle, Italian thistle, slender-flowered thistle	61
Centaura repens	Russian knapweed	NR[2]
Cirsium arvensis	Canada thistle	76
Convolvulus arvensis	field bindweed	56
Cytisus scoparius	Scotch broom	69
Dulichium arundinaceum var. *arundinaceum*	three-way sedge	NR[2]
Elodea canadensis	Canadian waterweed	79
Elodea nuttallii	western waterweed	NR[2]
Elymus repens	Quakgrass	59
Euphorbia esula	leafy spurge	NR[2]
Galeopsis tetrahit	hempnettle	50
Geranium robertianum	Robert geranium	67
Heracleum mantegazzianum	giant hogweed	81
Hydrilla verticillata	hydrilla	80
Impatiens glandulifera	ornamental jewelweed	82
Lactuca tatarica var. *pulchella*	blue lettuce	NR[2]

Scientific name	Common name	Invasive ranking 0-100 (low-high)[1]
Linaria vulgaris	yellow toadflax, butter and eggs	69
Lythrum salicaria	purple loosestrife, spike loosestrife	84
Myriophyllum spicatum	Eurasian watermilfoil	90
Nymphaea odorata ssp. *odorata*	American white waterlily	80
Polygonum polystachyum	Himalayan knotweed	80
Polygonum sachalinense	giant knotweed	87
Potentilla recta	sulphur cinquefoil	57
Rorippa austriaca	Austrian fieldcress	NR[2]
Rubus discolor	Himalayan blackberry	77
Senecio jacobaea	tansy ragwort	63
Solanum carolinense	horsenettle	NR[2]
Sonchus arvensis	perennial sowthistle	73
Spartina alterniflora, S. anglica, S. densiflora, S. patens	Smooth cordgrass, common cordgrass, denseflower cordgrass, saltmeadow cordgrass	86
Vicia cracca ssp. *cracca*	bird vetch	73
Zostera japonica	dwarf eelgrass	53

[1] Ranking designated by the Alaska Natural Heritage Program; for more information see http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm
[2] Not ranked by Alaska Natural Heritage Program

Criterion 2: Where to Treat - Target Locations and Pathways of Spread

Also important in deciding what to treat is the location of the infestation. Target locations are based on the sensitivity of the habitat, the relative risk of changing ecosystem functions within the habitat as a result of the infestation, and/or the underlying desired condition (as defined by the LUD) for the site. The concept of high-value habitat is used as a means of defining areas with a specific environmental, biodiversity or landscape value for which there is special interest or concern relative to the overall area. Biological hotspots in the landscape include high-value habitats, such as estuaries, beach meadows and riparian habitats, especially floodplains and fens. Specific areas designated to be managed in natural, or near natural conditions, are high-value habitats. In the project area, these include Wilderness areas, remote recreation areas and Research Natural Areas.

Pathways of spread, or vectors, include transportation methods of dispersing seeds and other plant propagules of the target species. These include road corridors, marine access facilities, rock quarries, vehicles and equipment, water and air. A sound strategy for control includes a focus on areas associated with vectors that are likely to spread the infestation. For evaluating priority treatment locations, site types are used to capture these common vectors.

Criterion 3: Management Objective for the Infestation

Once the highest priority infestations have been determined based on what and where, the management objective for the infestation should be considered. The management objective is often times based on the likelihood of success considering the resources needed and those available, including adequate funding. In practice, a combination of management priorities and

treatment techniques would be implemented in any given year. There are three management objective definitions identified which would be considered in concert with criteria 1 and 2 above.

Eradicate: Total removal or elimination of the last remaining individual weed species in the target infestation on a given site. It is determined to be complete when the target species is absent from the site for a continuous time period (that is, several years after the last individual was observed).

Control/Contain: Reduce the size of the infestation over time and prevent the spread of the weed beyond the perimeter of patches or infestation areas mapped from current inventories.

Tolerate: Accept the continued presence of established infestations; however, try to exclude new infestations through prevention practices. This objective applies to target species infestations that are widespread but occur in habitat types that have a low susceptibility for ecological damage, and for infestations of weed species that are not directly threatening ecosystem functions at a particular location.

Table 7 displays a general overview of the management objectives that would be applied under various site conditions.

Table 7. Management objectives for various site conditions.

Site condition	Eradicate	Control/Contain	Tolerate
New infestations that can be easily treated with minimal effort and maximum benefit.	X		
Infestations of species with potential for significant ecological functions, such as sensitive plant and animal habitat, wetlands, fens, bogs and alpine areas.	X	X	
Infestations which are extremely difficult to eradicate or control, such as large, well-established infestations of target species.		X	X
Other less aggressive target weed species which have less potential for significant ecological impacts.			X
Sites types that contain target weeds which have potential to more rapidly spread seeds and propagules, such as rock quarries, roads, marine access facilities, trailheads, parking lots, and high use recreation sites.	X	X	X
Non-development Land Use Designations, such as Wilderness areas, Special Interest Areas, including special botanical areas or geologic areas, and Research Natural Areas.	X	X	
Areas where active restoration activities are taking place and where weed control is essential for successful restoration objectives to be met.	X	X	

Selection of the Most Cost-efficient and Effective Treatment Method

After prioritizing target species, target locations and management objectives, there are 5 steps in selecting the most cost-efficient and effective treatment method for a particular infestation:

Step 1: Research, review and consider all known treatment alternatives, given site consideration inputs.

Tool(s) and treatment technique(s) selected will depend on many different variables, called site considerations. These considerations include biotic and abiotic resources and factors that, if not considered properly, are likely to adversely affect the success of the treatment and restoration strategy. These factors include the following (note the site considerations below represent only a sample of all possible variables):

- Habitat type (wetlands, riparian area, alpine, disturbed sites, uplands, etc.);
- Population density (percent cover);
- Human environment and safety (front country, back country, use level);
- Sensitive or designated natural and cultural resources (water, Wilderness, prehistoric and historic artifacts and landscapes, threatened, endangered and sensitive species);
- Infestation size (in acres);
- Location (widespread, accessibility, isolated and distinct).

Step 2: Select treatment techniques (see Section 2.4.5 below) and identify project design features (PDFs) (Section 2.5) required to eliminate adverse impacts.

Once appropriate treatment techniques and tools are identified, impacts caused by their use also need to be identified. All tools and techniques will have some type of consequence, whether intentional or unintended, beneficial or adverse, direct or indirect. At this point in the decision-making process, steps need to be identified to reduce or eliminate any potential adverse impact to the site considerations identified above. These steps can be PDFs that are practices incorporated into the planning phase of the treatment to prevent potential adverse impacts (e.g., weed control treatments will occur pre-emergence or post-seed set for any rare plants nearby).

Step 3: Review economic viability and feasibility of selected techniques (see Weed Treatment Costs below).

If the selected treatment techniques and conservation/mitigation measures are affordable, effective and practical then the treatment plan is approved for implementation.

Step 4: Interdisciplinary team (IDT) and decision maker review treatment plan.

IDT specialists would review draft treatment plans to ensure consistent and effective treatment is applied for each resource, and appropriate PDFs are included. Next, the decision maker (s) would review the treatment plan, and if in agreement that the proposed treatments are within the scope of the effects analyzed within this EA, approve the plan for implementation. Any sites where herbicide is proposed, a Pesticide Use Proposal (PUP) must be completed and reviewed by the Regional Pesticide Use Coordinator, and approved by the Regional Forester before implementation. All PUPs would be kept with the implementation records for this project.

Step 5: Implement and monitor where feasible and affordable; no action where infeasible and too expensive.

At a minimum, implementation of any treatment plan would include informal documentation (monitoring) of its effectiveness for at least 50 percent of the treatment acres. More formal monitoring may occur in cases where specific biological or ecological

thresholds are identified prior to treatment implementation. If the treatment or conservation/mitigation measures selected are NOT affordable, effective and practical, the treatment plan cannot be approved as it stands and the decision maker(s) needs to revert to lesser goals of containment or tolerate.

There may be cases when all known treatments and conservation/mitigation practices are not affordable, effective or practical and a determination of "No Action" must be made. This is not necessarily a decision to not address the problem at all (a "tolerate it" decision), rather, it is an acknowledgement that the problem may need to be monitored further and re-evaluated at a later date when more data or new control technologies/strategies become available or if changes in environmental circumstances render the problem more easily addressed using available techniques and strategies.

2.4.5 Methods of Weed Treatment

The action alternatives propose a variety of weed treatment methods. This section offers a brief description of those proposed for manual/mechanical weed removal (Alternatives 2 and 3) and herbicide treatments (Alternative 2 only). Descriptions are based on Tu et al. (2001) and edited for local conditions and knowledge.

Target species within the project area were assigned potential treatment methods (see Table 8) that will be refined at implementation. Treatment types vary depending on the potential negative impacts of a given resource value or sensitivity of the treatment method to the site (or adjacent lands). Treatment methods are related to each criterion shown above, and designed to meet the management objectives of either eradicate, control/contain or tolerate.

Common control measures for target weed species

Table 8 summarizes common control measures to achieve treatment objectives for the current project area weed inventory. Site-specific prescriptions would be refined in the annual treatment plans. Design of site-specific prescriptions would follow the Implementation Decision Making Process (described in Section 2.4.4) and comply with project design features (listed in Section 2.5). New infestations (including species not listed in Table 1) would be treated with similar control measures. Acreage is shown for all inventoried species within the project area.

Table 8. Common control measures by target species

Target species – common name, scientific name, code	Common control measures documented	Effective herbicides	Infestation inventory (acres)
Spotted knapweed *Centaurea stoebe* ssp. *micranthos* (CESTM)	- Hand pulling individual plants is the priority treatment. -Spot spraying may be used for follow-up to hand pulling. - These treatments may take up to ten years due to long-term seed viability.	Glyphosate Aminopyralid	0.1

Target species – common name, scientific name, code	Common control measures documented	Effective herbicides	Infestation inventory (acres)
Bull thistle *Cirsium vulgare* (CIVU)	-Hand pulling rosettes or digging with a trowel is the priority treatment method along with clipping seed heads. -Spot spraying before bolting[2] used in areas with dense infestations. If bolted[10], removal and bagging of seed heads followed by herbicide application.	Aminopyralid Glyphosate	5
Common brassbuttons *Cotula coronopifolia* (COCO7)	-Hand pulling individual plants is the priority treatment. -Torching may be used. -Spot spraying may be used.	Glyphosate Aminopyralid	104.6
Narrowleaf hawksbeard *Crepis tectorum* (CRTE3)	- Spot spraying is the priority treatment - Hand pulling individual plants as needed.	Glyphosate	< 0.1
Purple foxglove *Digitalis purpurea* (DIPU)	- Hand pulling is the primary treatment.	Aminopyralid	0.37
Japanese knotweed *Polygonum cuspidatum* (POCU6)	- Spot spraying individual plants while flowering is the priority treatment. - Stem injection may be used as an alternate herbicide treatment (3 mL/stem). - If herbicides are used, manual treatments could be used for follow-up.	Glyphosate Imazapyr	19.6
Orange hawkweed *Hieracium aurantiacum* (HIAU)	- Tarping and hand pulling are the priority treatment methods for small populations (>0.05 acre). - Spot spraying individual plants is primary treatment method for large populations. - Herbicide treatment is most effective. Some manual removal or covering with a plastic tarp possible for small infestations. - If herbicide is used, manual treatments could be used for follow-up.	Aminopyralid	4.2
Wall hawkweed *Hieracium murorum.* (HIMU)	-Spot spraying individual plants is priority -Tarping, torching and hand pulling as needed	Aminopyralid	31.9
Common St. Johnswort *Hypericum perforatum* (HYPE)	- Spot spraying in early stage is the priority treatment - Hand pulling plants as needed	Glyphosate Aminopyralid	0.03
Hairy cat's ear *Hypochaeris radicata* (HYRA3)	-Spot spraying individual plants is the priority treatment -Hand pulling will be used as needed	Glyphosate	3.2
Oxeye daisy *Leucanthemum vulgare*	-Spot spraying individual plants is the priority treatment. -Hand pulling will be used as needed	Glyphosate Aminopyralid	3.5

[2] A plant that has bolted has produced its flowering stem.

Target species – common name, scientific name, code	Common control measures documented	Effective herbicides	Infestation inventory (acres)
(LEVU)			
Bird's-foot trefoil *Lotus comiculatus* (LOCO6)	-Spot spraying individual plants is the priority treatment. -Digging with a hand trowel (must remove all root fragments) as needed.	Glyphosate	0.4
Sweetclover *Melilotus officinalis* (MEOF)	-Small, isolated populations will be treated using variety of treatment methods; include hand pulling, mowing, torching and herbicide.	Aminopyralid	3.7
Reed canarygrass *Phalaris arundinacea* (PHAR3)	-Small, isolated populations will be treated using variety of treatment methods; include tarping, hand pulling, mowing and herbicide.	Glyphosate Imazapyr	167.7
Common plantain *Plantago major* (PLMA)	- Hand pulling is primary treatment - Spot spraying individual plants as needed - Torching as needed -To be treated only in sensitive areas, tolerated everywhere else.	Glyphosate Aminopyralid	30.9
Tall buttercup *Ranunculus acris* (RAAC3)	- Hand pulling or torching is primary treatment - Spot spraying individual plants as needed - To be treated only in sensitive areas, tolerated everywhere else.	Aminopyralid	< 0.1
Creeping buttercup *Ranunculus repens* (RARE3)	- Hand pulling or torching is the primary treatment. - Spot spraying individual plants as needed. - To be treated only in sensitive areas, tolerated everywhere else.	Glyphosate Aminopyralid	14.9
European mountain ash *Sorbus aucuparia* (SOAU)	- Cut-stump herbicide treatment would be used.	Glyphosate	< 0.1
Dandelion *Taraxacum officinale* (TAOF)	- Hand pulling is the primary treatment. - Spot spraying individual plants.	Glyphosate	35.0
Common tansy *Tanacetum vulgare* (TAVU)	- Spot spraying individual plants is the priority treatment. - Hand pulling will be used as needed	Glyphosate Aminopyralid	0.1
Alsike clover *Trifolium hybridum* (TRHY)	- Hand pulling individual plants is the priority treatment. -Spot spraying may be used as needed as a follow up to hand pulling -To be treated only in sensitive areas, tolerated everywhere else.	Aminopyralid	7.3

Target species – common name, scientific name, code	Common control measures documented	Effective herbicides	Infestation inventory (acres)
Red clover *Trifolium pretense* (TRPR2)	- Hand pulling individual plants is the priority treatment. -Spot spraying may be used, as needed, to follow up hand pulling. -To be treated only in sensitive areas, tolerated everywhere else	Glyphosate Aminopyralid	0.6
White clover *Trifolium repens* (TRRE3)	-Digging with a hand trowel is the priority treatment. -Spot spraying may be used, as needed, to follow up digging with hand trowel. -To be treated only in sensitive areas, tolerated everywhere else.	Glyphosate Aminopyralid	24.5

Note: Only aquatic formulations of glyphosate and imazapyr are proposed. Aquatic formulations of aminopyralid do not currently exist.

Weed treatment costs

Integrated weed treatments need to be timely and cost-effective, and result in the desired treatment strategy for the particular infestation being treated (i.e., containment, control or eradication). Treatment costs and potential need for re-treatment are directly affected by the range of treatment methods available. Increased costs and limited effectiveness reduce the total acreage that can be effectively treated in a given year or throughout the life of the project.

Concerns about project cost and financial efficiency were expressed during scoping (Section 1.6.6). This issue is addressed by evaluating the estimated time and money it will take to treat the target weeds by general treatment method (herbicide or manual/mechanical).

Based on budget allocations and accomplishment reporting over the past 5 years for both ranger districts, the estimated average cost of treatment is approximately $2,300/acre/year (Krosse 2013a, unpublished report). This figure does not differentiate between treatment methods since the details were not tracked in previous weed treatment efforts. Although this estimate should be used with caution and considered a preliminary finding, it provides a figure to compare the cost-effectiveness of the general treatment methods.

Spot and hand herbicide application would likely be the most cost-effective method considered for this project given an average effectiveness rate of 80 percent. Manual and mechanical treatments have an average effectiveness of 25 percent (USDA Forest Service 2008a). For more details on how cost-effectiveness is considered in this analysis, see the Weeds and Treatment Effectiveness section in Chapter 3, specifically the Treatment Effectiveness section.

Manual and mechanical methods considered in the action alternatives

Manual techniques include hand pulling, clipping or digging out weeds with non-motorized hand tools. Digging would be done with a hand trowel, rather than with a shovel, to protect any unidentified cultural resources. Mechanical methods involve chain saws, mowers, or other mechanized equipment. These techniques tend to minimize damage to desirable plants and animals, but they are generally labor and time intensive which makes them better options for treating small infestations or in situations where a large pool of volunteer labor is available. Manual and mechanical treatments are often used in combination with other techniques.

With these treatment methods, it is anticipated 80 percent of the treated acres would need multiple treatments (treated once a year over several years) before the target plant species are eradicated, controlled or contained.

Alternatives 2 and 3 approve the manual and mechanical treatment options listed below. Table 8 displays proposed treatment techniques based on the current infestations within the project area. These treatment options are the most likely treatment methods for a given target species at the time of implementation, but are subject to change given conditions specific to each site.

Hand Pulling

The key to effective hand pulling is to remove as much of the root as possible while minimizing soil disturbance. For many species, any root fragments left behind have the potential to re-sprout, and pulling is not effective on plants with deep and/or easily broken roots. Most weed-pulling tools are designed to grip the weed stem and provide the leverage necessary to pull its roots out.

Weed wrenches and other tools are surprisingly powerful and can enable a person to control large saplings and shrubs that are too big to be pulled by hand. Tools vary in their size, weight, and the size of the weed they can extract. The Root Talon is inexpensive and lightweight, but may not be as durable or effective as the all-steel Weed Wrench, which is available in a variety of sizes. Both tools can be cumbersome and difficult to carry to remote sites. Both work best on firm ground as opposed to soft, sandy, or muddy substrates.

Summary of considerations for hand pulling:

- Advantages: Small ecological impact, minimal damage to neighboring plants, and low (or no) cost for equipment or supplies.
- Disadvantages: Extremely labor intensive; effective only for relatively small areas, even when abundant volunteer labor is available.
- Pulling or uprooting plants can be effective against some shrubs, tree saplings, and herbaceous weeds.
- Annuals and tap-rooted plants are particularly susceptible to control by hand-pulling.
- It is not as effective against many perennial weeds with deep underground stems and roots that are often left behind to re-sprout.
- It is easy to plan and implement, and is often the best way to control small infestations, such as when a weed is first detected in an area.
- It may be a good alternative in sites where herbicides or other methods cannot be used.

Clipping

The seed heads and/or fruiting bodies are cut or removed to prevent germination and disposed of properly (Figure 3). Clipping is labor intensive but effective for small and spotty infestations.

Figure 3. Clipped Scotch thistle seed heads for disposal.

Clipping and Prying

A portion of the stem is cut and the remaining portion is pried from its substrate. This method is labor intensive, but can be effective for larger infestations.

Mowing, Cutting, Brush Hog, Raking, Trimming, Weed-eating

Mowing and cutting can reduce seed production and restrict weed growth, especially in annuals cut before they flower and set seed. Some species however, re-sprout vigorously when cut, replacing one or a few stems with many that can quickly flower and set seed.

These techniques are used as primary treatments to remove aboveground biomass followed by an herbicide application to prevent re-sprouting. They are also used as a follow-up to treat target plants missed by an initial herbicide treatment.

Girdling

Girdling is often used to control trees or shrubs that have a single trunk. It involves cutting away a strip of bark several centimeters wide all the way around the trunk. The removed strip must be cut deep enough into the trunk to remove the vascular cambium, or inner bark, the thin layer of living tissue that moves sugars and other carbohydrates between areas of production (leaves), storage (roots), and growing points. This inner cambium layer also produces all new wood and bark.

Torching

Fueled by propane, weed torches allow an applicator to apply direct heat to kill target species.

Torching works by damaging the waxy cuticle that protects the cells in plants' leaves. Eradication isn't immediate; weeds may need to be torched a few times before they are controlled.

Weed torches will kill the beneficial soil micro-organisms that help plants thrive and the heat from the torch can damage desirable plants nearby. It is suggested that treatment occurs at least 5 feet away from non-target plants.

Tarping/Solar

Tarping (also called solarization) involves covering infestations with black plastic in order to shade/kill rhizomes (Figure 4). It works best on small areas and is not considered efficient on large areas. One disadvantage of tarping is that all vegetation under the tarp is killed; meaning impacts to non-target plants is high. Tarping requires a minimum of annual maintenance and several years of treatment to be effective.

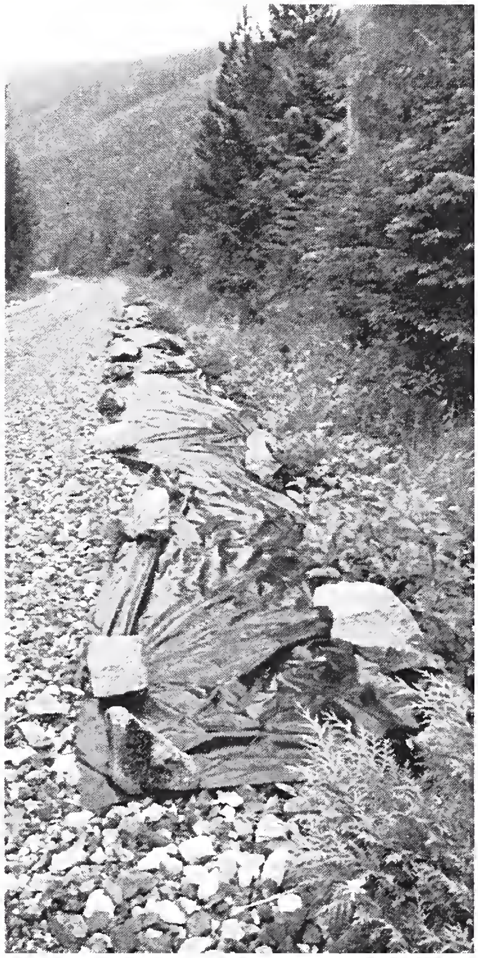

Figure 4. Tarping orange hawkweed along the roadside on Zarembo Island, Wrangell Ranger District.

Herbicides selected and application methods considered in the Proposed Action

Herbicide formulations, properties and general uses

Table 9 summarizes the active ingredients (either glyphosate, imazapyr or aminopyralid), examples of formulations (e.g., AquaPro®, AquaMaster®, Habitat®, Rodeo®), properties, and general uses of the three herbicides included as part of the Proposed Action. Herbicide treatments would be applied in accordance with label advisories, local, state and federal pesticide laws and regulations, Forest Plan management direction, human health and ecological risk assessments, and applicable PDFs identified in this document. These specific design features would be applied to minimize or eliminate the potential for weed management to adversely affect non-target plants, animals, human health, water quality, and aquatic organisms.

At a minimum, only certified personnel or those under the supervision of a certified applicator would be allowed to use restricted-use pesticides (FSM 2154.2; USDA Forest Service 1994b).

All herbicides considered under the Proposed Action have human health and ecological risk assessments that are posted on the Forest Service website (http://www.fs.fed.us/foresthealth/pesticide/risk.shtml).

Table 9. Herbicides considered for use in the Proposed Action (Alternative 2), including formulations, mode of action, properties and typical and maximum application rates.

Active ingredient, formulations and mode of action	Risk assessment year and reference	Herbicide properties	General uses/type of plants it is known as an effective treatment	Typical to highest application rate from risk assessment (pounds of acid equivalent/acre) (lb a.e./acre)
Glyphosate (e.g., AquaPro®, Aquamaster®, Rodeo®) Inhibits 3 amino acids and protein synthesis.	2011 – SERA TR-052-22-03b	A systemic broad-spectrum, non-selective herbicide. Translocates to roots and rhizomes of perennials. While considered non-selective, sensitivities do vary depending on species. Quickly taken up by target plants. Adheres to soil, which lessens or retards leaching or uptake by non-targets.	Most effective on perennial plants when applied in later summer and fall, when plants are entering dormancy. Used to control floating-leaved plants and shoreline plants. It does not work on underwater plants[3]. Plants can take several weeks to die and a repeat application is often necessary to remove plants missed in first application[4]. AquaPro®, Aquamaster® and Rodeo® have been approved for aquatic environments and can be used when surface water is present.	2 - 7
Imazapyr (e.g., Habitat®) Amino acid synthesis inhibitor.	2011 – SERA TR-052-29-03a	A systemic broad-spectrum, slow-acting, non-selective, pre- and post-emergent herbicide. Most effective as a post-emergent. Low potential for leaching into ground water. Has low toxicity to invertebrates and is non-toxic to fish, mammals, and birds. It can damage non-target plants, by transfer between root networks.	Used to treat annual and perennial grasses, vines, brambles, broadleaf species and floating-leaved plants. It's effective on underwater plants. Habitat® has been approved for aquatic environments and can be used when surface water is present.	0.45 – 1.25

[3] http://www.ecy.wa.gov/programs/wq/plants/management/aqua028.html (accessed 2/12/2013)
[4] http://www.ecy.wa.gov/programs/wq/plants/management/aqua028.html (accessed 2/12/2013)

Active ingredient, formulations and mode of action	Risk assessment year and reference	Herbicide properties	General uses/type of plants it is known as an effective treatment	Typical to highest application rate from risk assessment (pounds of acid equivalent/acre) (lb a.e./acre)
Aminopyralid (e.g., Milestone®, Milestone VM®) Mimics natural plant hormones.	2007 - SERA TR-052-04-04a	A selective, systemic herbicide. Post-emergent herbicide that controls the entire plant, including the roots, with soil residual activity to extend control[5]. It is absorbed by the foliage and roots of actively growing plants and translocated to the meristematic (high-growth-rate) areas of the plants, including the roots[6]. Also a pre-emergent herbicide.	Used to treat annual, biennial and perennial broadleaf species. Provisionally registered as a reduced risk herbicide[6]. Low risk to aquatic environments; avoid ground water contamination	0.078 – 0.11

The trade names mentioned above (AquaPro®, AquaMaster®, Rodeo® and Habitat®) are those currently registered in Alaska by the Alaska Department of Environmental Conservation.

Herbicide selection and application rates

The previous table (Table 9) shows the typical and highest application rates based on the cited risk assessments. In most cases, the lowest effective rate would be used. Highest application rates may be used if necessary, but these would be applied to patchy infestations and in no case would an acre receive more than the typical rate in a year. The SERA (Syracuse Environmental Research Associates, Inc.) risk assessment reference and year is also given.

Additives (adjuvants, surfactants and inerts) and Impurities

Herbicides generally need to be applied with an adjuvant. There are several types of adjuvants including surfactants, non-foaming agents and colorants. These are discussed in the Human Health section of Chapter 3.

Herbicide Treatment Techniques

Spot spray

When using this application method, herbicide is sprayed directly onto small patches or individual target plants; non-target plants are avoided. The applicators range from motorized rigs with spray hoses to backpack sprayers to hand-pumped spray or squirt bottles, all of which can target very small plants or parts of plants. Drift is far less of a concern because the applicator ensures spray is directed immediately toward the target plant.

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[5] http://www.ipaw.org/invaders/AminopyralidFamilyBrochure.pdf (accessed 2/12/2013)

[6] In other words, the U.S. EPA has concluded that the use of Aminopyralid as a replacement for other herbicides will decrease risk to some non-target species. http://www.fs.fed.us/foresthealth/pesticide/pdfs/062807_Aminopyralid.pdf (page 5) (accessed 2/12/2013)

Hand/Selective

Hand/selective methods treat individual target plants, reducing the potential for herbicide to impact soil or non-target organisms. Hand/selective methods include wicking and wiping; foliar application; basal bark treatment; frill, hack, and squirt, stem injection, and/or cut-stump methods. Descriptions of these methods follow.

- *Wicking, wiping, and other stem and leaf application* - Involves using a sponge, spray bottle, paint brush, cloth and/or a wick on a long handle to wipe herbicide onto foliage and stems. Use of a wick eliminates the possibility of spray drift.

- *Stem injection* - Herbicides can be injected into herbaceous stems using a hand held injection system with an attached needle. Herbicide pellets can also be injected into the trunk of a tree using a specialized tool. Higher concentrations of active ingredients are often needed for effective stem injection, for instance, the maximum label rate of aquatic labeled glyphosate can be used to effectively kill knotweed by stem injection (USDA Forest Service 2008a)

- *Cut-stump* - This method is often used on woody species that normally re-sprout after being cut. The tree or shrub is cut down and herbicide is immediately sprayed or squirt on the exposed cambium (living inner bark) of the stump. The herbicide must be applied to the entire inner bark (cambium) within minutes after the trunk is cut. The outer bark and heartwood do not need to be treated since these tissues are not alive. The cut stump treatment allows for a great deal of control over the site of herbicide application, and therefore, has a low probability of affecting non-target species or contaminating the environment. It also requires only a small amount of herbicide to be effective.

Weed treatment methods not included in the action alternatives

- Herbicide application using aerial or broadcast spraying
- Prescribed burning
- Plowing/tilling/disking/digging with heavy equipment
- Grazing
- Flooding/drowning
- Steaming and foaming

2.4.6 Restoration

Treatment site restoration is a component common to both action alternatives and may include mulching, seeding, and/or active revegetation, or may be passive in situations where desirable vegetation can naturally replace the removed target weeds. Treatment site restoration is part of the prescription developed during implementation planning. Restoration prescriptions would be influenced by site-scale conditions and broader land management objectives.

The analysis assumption is that passive restoration will be successful on about 90 percent of the treatment sites, with 10 percent needing some kind of mulching, seeding, and/or infrequent planting. This proportion is based on the range of situations evident surrounding the inventoried weed populations known across the Tongass National Forest. For instance, meadows and forested areas are most likely to respond favorably to passive restoration, while roadsides and other highly

disturbed areas may require mulching and/or seeding/planting with desirable vegetation. The intent is to re-establish competitive local, native vegetation post-treatment in areas of bare ground. In some cases, preferred non-natives may be utilized as temporary ground cover for erosion control and as weed competitors, until native species can become established at the site.

Preferred non-natives would not aggressively compete with natives, persist long-term, or exchange genetic material with local native plant species. See the Tongass National Forest erosion control guidance (or Appendix D of the Non-Native Plants resource report) for seeding specifications and other vegetation restoration options using both non-native, non-aggressive species and native plants.

Evaluation for site restoration may occur before, during and after herbicide, manual and mechanical treatments. Passive site restoration would be favored in areas having a stable, diverse, native plant community and sufficient organics in the soil to sustain natural revegetation. If the soils lack sufficient organics, mulch may be added.

In addition to standard grass seed mixtures, nitrogen-fixing native shrubs and forbs, such as alder and lupine, may be seeded or planted to provide soil nutrients to the site. Shrubs can aid the establishment of understory species by increasing shade which promotes understory vegetation development of native forbs as well as inhibits establishment of sun-loving weeds. Native shrubs may also be planted where rapid revegetation is desired or where a shrub community is the desired condition.

Specific methods and guidelines for revegetation of weed sites and disturbed areas would be addressed in the annual weed treatment plans (Appendix B). Restoration plans are expected to outline existing and potential site conditions and develop long-term revegetation strategies that are effective, affordable, and consistent with the ecological context and land management objectives of the site and surrounding landscape. In general and where possible, site restoration strategies promote the use of local native plant materials to establish competitive plant cover and meet the long-term objective to restore ecosystem functions.

2.4.7 Monitoring Recommendations

A critical component to effectively treating weed infestations is monitoring. Two types of monitoring are addressed: 1) implementation monitoring and 2) effectiveness monitoring.

The overall strategy for monitoring treatments in the project area is to monitor where feasible and affordable; no action would be taken where infeasible and too expensive.

Implementation Monitoring

At a minimum, implementation of any treatment plan would include annual accomplishment reporting. Accomplishment reporting is done through the Forest Service Activity Tracking System (FACTS). A requirement of accomplishment reporting is to delineate the infestation acres and treatment area, entering that information into the NRIS-IS database. In addition, treatment acres and treatment methods, including specific chemical brands used (for herbicide applications) are documented. Cost of treatments would also be documented and monitored throughout the project. A general efficacy rating would also be entered into the database.

Approximately 50 percent of the treatment acres would be monitored for implementation and efficacy every year, as a requirement of Forest Service accomplishment reporting.

Effectiveness monitoring for weed treatments

As part of the 2008 Forest Plan Revision, two monitoring questions, relevant to monitoring the project, would be addressed. They are as follows:

- What are the status and trends of areas infested by aquatic and terrestrial invasive species relative to the desired condition?
- How effective were management activities, including those done through partnerships, in preventing or controlling targeted invasive species?

To answer the first monitoring question, a Forest-wide invasive plant monitoring protocol would be implemented (see Appendix E of the Non-native Plants resource report). To answer the second monitoring question, the following three protocols would be implemented:

1. High-priority site monitoring
2. Project/permit mitigation monitoring
3. Public education/outreach and partnerships monitoring

High-priority sites are identified by ranger district weed plant management plans[7] (or an equivalent process) as having the highest risk of impacts due to new infestations and/or spread of existing infestations of weeds. The number and location of high-priority sites to be monitored would be determined at the beginning of each sampling/reporting period, in this case, 2014. Annual operating plans for weed treatments will identify any high-priority sites that will be forwarded to the Forest monitoring coordinator for monitoring.

If an increase in the number of infestations or an increase in infested area of high-priority weeds is detected at a monitored high-priority site at the end of a sampling/reporting period, the weed management plan or strategy for that site will be reviewed. Management actions will be evaluated and adjusted to reduce the occurrence and/or area of infestations.

Monitoring Treatment Strategies

More formal monitoring may occur in cases where specific biological or ecological thresholds are identified prior to treatment implementation. Annual operating plans will include an appraisal of treatment strategies and identify any treatment areas where the strategy may not adequately address the impact of weeds on the site. If the treatment or conservation/mitigation measures selected are not affordable, effective and practical, the treatment plan cannot be approved and the decision maker(s) needs to revert to lesser goals of containment or tolerate.

There may be cases when all known treatments and conservation/mitigation practices are still not affordable, effective or practical and a determination of "No Action" must be made. This is not necessarily a decision to not address the problem at all (a "tolerate it" decision), rather, it is an acknowledgement that the problem may need to be monitored further and re-evaluated at a later date when more data or new control technologies/strategies become available or if changes in

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[7] USDA Forest Service. 2009. Unpublished. Wrangell Ranger District Invasive Species Management Plan;
USDA Forest Service. 2006. Unpublished. Non-Native Invasive Species Management Plan for the Petersburg Creek-Duncan Salt Chuck Wilderness;
USDA Forest Service. 2012. Unpublished. South Etolin Wilderness Invasive Plant Plan;
USDA Forest Service. 2012. Unpublished. Non-Native and Invasive Plant Management Plan for the Tebenkof and Kuiu Wildernesses.

environmental circumstances render the problem more easily addressed using available techniques and strategies.

2.5 What are the project design features?

The following design features (protection/mitigation measures) were designed to reduce potential adverse effects from the action alternatives. This section displays those specific to Alternative 2 (i.e., specific to the potential use of herbicides) and those applicable for both action alternatives (Alternatives 2 and 3), except where noted. For emphasis, some design features include herbicide label guidance and Forest Plan standards. However, not all Forest Plan standards or label directions are repeated here. Forest Plan standards and label directions would be followed, regardless.

2.5.1 General Design Features

1. Product Labels (BMP 15.2; Chem-2)

    - Comply with standards on herbicide selection, tank mixing, licensed applicators, and use of adjuvants, surfactants and other additives.

    - Carefully review labels and ensure that application is consistent with the product's directions.

    - Use only aquatic formulations or low aquatic risk herbicides on saturated soils (including wetlands), or those with seasonally high water tables, where label restrictions allow.

2. Herbicide applicator will be proficient at reading and following herbicide labels.

3. Forest Service specialists will work closely with herbicide applicators to ensure project design features are implemented.

4. Marker dyes will be used to mark where herbicides have been applied during treatment to avoid over spraying.

5. Prior to treatment, weed specialist will confirm species/habitats of local interest or concern, watershed and aquatic resources of concern (e.g., hydric soils, streams, lakes, roadside treatment areas with higher potential to deliver herbicide, municipal watersheds, domestic water sources), and nearby places where public use is known, such as recreation sites (BMP 15.5; Chem-1).

6. The Herbicide Transportation, Handling, and Emergency Spill Response Plan and spill kit will be on-site when herbicide treatment methods occur. This Plan will include reporting procedures, project safety planning, methods of clean-up of accidental spills, and information including a spill kit contents and location as noted in Forest Service Manual 2150 (USDA Forest Service 1994b), Pesticide-Use Management and Coordination and Handbook 2109.14 (USDA Forest Service 1994a) (BMP 15.4; Chem-3; Chem-5; Fac-7).

    - No more than daily use quantities of herbicides will be transported to the project site. The exception is for crews staging in remote locations. Under these circumstances,

they can bring sufficient quantities of herbicides to last for the planned duration of the field work (i.e., multiple days).

- Equipment used for transportation, storage, or application of herbicides will be maintained in a leak-proof condition.
- Herbicide containers must be secured and prevented from tipping during transport.
- To reduce the potential for spills, impervious material, such as a bucket or plastic, will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.
- Immediate control, containment, and cleanup of fluids and herbicides due to spills or equipment failure (broken hose, punctured tank, etc.) will be implemented. All contaminated materials will be disposed of promptly and properly to prevent contamination of the site. All hazardous spills will be reported immediately to the Forest Hazardous Spill Coordinator.
- Herbicide spray equipment will not be washed or rinsed within 150 feet of any body of water or stream channel. All herbicide containers and rinse water will be disposed of in a manner that would not cause contamination of waters.
- Mixing and loading of herbicide(s) will take place a minimum of 150 feet away from any body of water or stream channel unless prior approval is obtained from a Forest Service hydrologist or biologist.

2.5.2 Project Design Features by Resource

Sensitive and Rare Plants and Non-target Vegetation

7. The Forest-wide Standards and Guidelines for Plants state that no herbicide shall be applied within 60 feet of any identified population of a sensitive plants species (USDA Forest Service 2008b, p. 4-41). For this project, to be conservative, there will be a 100-foot no-herbicide buffer around all known rare and sensitive plants.

8. Pre-treatment plant surveys are required before any treatment is conducted on a weed population. Surveys will identify all possible non-target rare plant species within 200 feet of the weed population. If a weed population is found to be 100 feet or closer to a non-target rare plant and it is a target weed whose control recommends herbicide treatment, the treatment method will be modified to only manual or mechanical treatments options. However, some species, such as Japanese knotweed, where both manual and mechanical treatments have the potential to increase the infestation, the district ranger may choose to decrease the buffer distance to 60 feet (per Forest Plan direction) to reduce the most aggressive weed populations and still protect non-target rare plants.

9. The treatment timeframe is an important factor for mitigating possible effects to non-target rare plants. Some weeds come up early in the spring and remain green until late in the fall. Therefore, if possible, treat weeds with herbicides after non-target rare plants have senesced (typically after mid-late August) to further avoid spray drift or run-off on the non-target rare plant population.

10. If a Forest Service sensitive plant location is found during pre-project surveys or while the project is being implemented, the district botanist will be notified. If the proposed treatment will affect sensitive species, mitigation measures will be developed to avoid any adverse effect to the plant species. Until consultation with the botanist is complete, no foliar or spot spraying will be allowed within 100 feet of the occurrence; non-foliar and non-spot herbicide treatments (e.g., hack and squirt, cut stump, etc.) will be allowed no closer than 60 feet of these species. These buffers will remain in effect until consultation with the district botanist is completed and the final treatment prescription is developed.

11. All Forest Service sensitive plants will have a 100-foot buffer. Larger buffers may be developed on a case-by-case basis. The buffer size will be determined based on: (1) phenology at time of treatment; (2) rareness of species; (3) vulnerability to herbicide being used; (4) the concentration of herbicide; and/or (5) environmental conditions and terrain. Prior to project implementation, the forest botanist will review all information, including any new information, and develop buffers that will minimize effect to Forest Service sensitive plant species to negligible or minor.

12. If known rare or sensitive plant populations are within 200 feet of a weed population treated with herbicides, monitor the rare and sensitive plant populations as well as the weed infestations for 2 years after treatment.

Non-native Species

13. To reduce seed spread during weed treatments, remove the flowering head and place in a container for disposal.

14. Areas with bare soil, created by the treatment of weeds, will be evaluated for restoration to prevent further infestations as noted in the restoration plan. Whenever possible, protect non-target vegetation to minimize the creation of exposed ground and the potential for the re-colonization of weeds. A Forest Service botanist will be consulted prior to any restoration activities.

15. Vehicles and all equipment must be washed before entering project treatment sites in areas that meet criteria established in the Tongass National Forest equipment and vehicle cleaning guidance (see Appendix B in Krosse 2013b). In such cases, the following applies:

    - Should vehicles travel through or park in weed infestations, the vehicle should be washed for a minimum of 6 minutes before entering the treatment project area. This includes wheels, undercarriages, bumpers and all parts of the vehicle.

    - Equipment (e.g., chain saws, hand clippers, pruners, etc.) and clothing must have all vegetation and seeds removed prior to entering and exiting project treatment site or placed in an enclosed area (e.g., back of an enclosed truck or a bag).

    - All cleaning must follow State of Alaska Water Quality Standards and associated BMPs.

16. Certified weed-free mulches (or a mulch approved by the Forest botanist) and weed-free seed sources will be used in restoration or soil stabilization efforts.

17. Efforts will be made to ensure seeds and/or vegetative propagules of weeds are removed from clothing and equipment prior to leaving treatment sites.

18. Transport of removed weeds with seeds or vegetative propagules will occur in enclosed disposal containers or in an enclosed vehicle.

19. Weeds to be disposed of off-site will be taken to a facility (i.e., landfill) that contains the disposed items or the weeds will be burned. Burning may require authorization though a burning permit.

20. If burning of removed weeds occurs, burn pile sites will be monitored the following year to assess potential needs for revegetation or additional weed removal treatments.

21. Where appropriate, barriers and notices will be installed to limit illegal OHV activity after treatment is complete. Examples of barriers are large rocks, soil berms, and cut vegetation.

Wildlife

22. The Bald Eagle Protection Act provides for special management for the bald eagle.

    - Manage bald eagle habitat in accordance with the Interagency Agreement established with USFWS to maintain habitat to support the long-term nesting, perching and winter roosting habitat capability for bald eagles.

    - If project activities are visible or can be heard from a nest, stay at least 330 feet (100 meters) from the nest, unless the eagles have demonstrated tolerance for similar activities (USFWS Guidelines).

23. Bear Habitat

    - Minimize adverse impacts to habitat and seek to reduce human/bear conflicts.

    - During project planning, evaluate the need for additional protection of important bear foraging sites (e.g., fishing sites) in addition to the buffers already provided by the Riparian and Beach and Estuary Fringe Forest-wide Standards and Guidelines.

24. If any Threatened, Endangered, candidate or Forest Service sensitive wildlife species are present, protective measures may include, but are not limited to the following: (a) avoid sensitive areas; (b) seasonal restrictions; or (c) treatment methods will be designed to avoid negative impacts.

25. In the event of a wildlife species protection status changing to Threatened, Endangered, or Forest Service sensitive, additional analysis will be completed to determine potential impacts. Reinitiating US Fish and Wildlife Service consultation will occur, if applicable.

26. Protect known active and inactive raptor nest areas from project activities.

27. Glyphosate should be applied below its upper limit (7lb a.e./acre).

Hydrology/Aquatics

28. Erosion Control (BMP 12.17; AqEco-2)

- Apply erosion control measures (e.g., silt fences or shut down periods) and native revegetation (e.g., mulching, native grass seeding, planting) for manual treatment where detrimental soil disturbance or de-vegetation may result in the delivery of measurable levels of fine sediment.

29. Buffers / Spray Distance to Water (BMP 14.6, 15.5; Chem-3)

- Minimum distance to water is 10 feet for hand application (e.g., wicking/wiping) or spot spraying of aminopyralid.
- Aquatic-based formulations of glyphosate and imazapyr may be applied up to water's edge using hand application or spot spraying techniques.
- Begin application of pesticide products nearest to the aquatic habitat boundary and proceed away from the aquatic habitat; do not apply towards a water body.
- In the marine environment, only aquatic versions of glyphosate and imazapyr based products can be applied up to the mean high tide line during low/outgoing tides with spot-spray and hand/select methods.
- Hand crews will stay out of flowing or ponded water whenever possible.
- If hand removal of weeds requires entry into flowing or ponded water, time in the water will be kept to a minimum.
- Weed treatments within 10 feet of bankfull width where spawning fish are present will occur within the recommended timing window for instream work for fish species present.

30. Public Water Sources (PWS) / Supplies (BMP 15.5; Chem-3)

- Before authorizing herbicide use within public water source watersheds, consult with ADEC, the affected municipality, and/or the owner/operator of the water system.
- Review the completed Source Water Assessment for the PWS watershed, available from ADEC prior to authorizing weed management activities in these watersheds.
- Herbicide use within 1,000 feet of domestic wells or public water supplies will be coordinated with the water user, manager, or local municipal water board.
- Minimum distance to surface waters is 200 feet for herbicide application within municipal watersheds.
- All herbicide application, storage, chemical mixing, refilling and post-application equipment cleaning is completed at least 200 feet from domestic wells or public water sources, and in accordance to label guidance relative to water contamination (BMP Chem-5).
- All known unclassified (private) water sources will receive the same consultation given to public systems, as outlined above, prior to herbicide application if located within a PWS source watershed. If located outside a PWS source watershed, consultation will occur if herbicide application is proposed within 1,000 feet of surface waters of known unclassified water sources.

31. Identify Riparian Areas (BMP 15.5; Chem-3)

    - Forest Service personnel will identify riparian areas prior to implementation of herbicide application.
    - Herbicide will not be applied to more than 10 acres along any single stream or riparian infestation per year.

32. Weather Conditions (BMP Chem-3)

    - Consider current and recent meteorological conditions. Rain events may increase pesticide runoff into adjacent water bodies. Saturated soils may inhibit pesticide penetration. Check forecast before applying any herbicides.
    - Herbicide will not be applied during or immediately prior to extreme rain events.
    - Do not apply herbicides when wind speeds exceed 10 mph.

33. If foliar/spot spraying application is required, the following techniques will be used to minimize drift (BMP 15.2, Chem-2):

    - Label directions regarding wind speed and temperature will be followed.
    - Within Riparian Management Areas (RMAs), herbicides will only be sprayed in a downward direction. If target plants are taller than 3 feet, the plants will be laid down and sprayed.

34. Herbicide usage will be limited to minimum amount required to be effective. Also see design feature #61.

35. A Pesticide Use Proposal (PUP) and an Alaska Pollutant Discharge Elimination System (APDES) permit must be obtained from the State of Alaska Department of Environmental Conservation prior to herbicide use (BMP Chem-1).

36. Pest Management Plan (BMP 15.2; Chem-2; Chem-3)

    - If pesticides must be applied, consider area, terrain, weather, droplet size, herbicide characteristics, and other conditions to avoid or reduce effects to aquatic organisms. Follow all label directions.

Wilderness Areas

37. No motorized equipment or mechanical transport will be used in Wilderness areas except for transportation to and from the site using either motorboats or floatplanes which are an exception provided in ANILCA Section 1110(a).

38. Crew size will be limited to 12 people or less.

39. Crew camps, if needed, will be located in previously-used campsites and crews will follow Leave-No-Trace guidelines (www.lnt.org).

Recreation

40. Within areas of concentrated public use and developed recreation sites, implementation will be limited to weekdays and non-holidays and avoid heavy-use periods.

41. Temporary public use closures are permitted in areas where the public and workers co-mingle and public safety is compromised because of operating equipment, hand tools, and/or the herbicide label requires it. Strategic timing of treatments could limit these temporary closures.

42. In advance of initiating treatment work, interpretive signing will be placed in developed recreation sites and areas of concentrated public use, such as picnic areas located on a road system (e.g., Blind Slough).

43. If herbicides are included as part of the weed treatment plan, a list of herbicide names, treatment dates, and a Forest Service contact (name and phone number) will be displayed at appropriate sites, broadcast in a public service announcement on the local radio station and/or published in the local newspaper, a minimum of 1 week prior to herbicide treatment. Also see design features # 59 and #62.

Soils

44. Forest Service personnel will identify local soil, water and vegetation conditions prior to implementation of herbicide application. Forest Service specialists will work closely with herbicide applicators to ensure project design features are implemented.

45. Application will be restricted to the minimal effective dosage that, when precisely applied to the target area at optimum times, will accomplish the resource management objectives. Also see design feature #61.

46. Treatments of large monocultures that leave bare soil will be revegetated. Revegetation will follow current Tongass standards for seed mix.

47. Avoid use of aminopyralid and imazapyr on coarse textured soil.

Wetlands

48. Herbicides applied on wetlands will be labeled as an aquatic approved herbicide.

Cultural Resources

49. If unanticipated cultural resource sites are found during implementation and ground disturbance is planned (including hand-digging and pulling), all work shall stop in the area that could adversely affect the site(s). The Zone Archaeologist will be contacted immediately and work will not precede in this area without his/her approval.

50. Consultation will occur with the zone archaeologist before hand-digging and pulling is permitted at a known historic property.

51. Protect known sensitive traditional tribal use areas.

52. Cultural resource monitoring may be used to enhance the effectiveness of protection measures in conjunction with other measures.

Herbicide Use/Human Health

53. At a minimum, only certified personnel or those under the supervision of a certified applicator will be allowed to use restricted-use pesticides (FSM 2154.2 [USDA Forest Service 1994b]). Also see design feature #1.

54. An Herbicide Transportation, Handling, and Emergency Spill Response Plan and spill kit will be developed prior to implementation of this project. See design feature #5.

55. Herbicides would be used in accordance with label instructions and advisories, except where more restrictive measures are required. Also see design feature #1.

56. Maintain a safety plan specific to this project that includes a job hazard analysis, including personal protective equipment/clothing (PPE) needs (FSH 6709.11 [USDA Forest Service 1999) and addresses risk and standard cleanup procedures (FSM 2153.3 [USDA Forest Service 1994b]; FSH 2109.14,16 [USDA Forest Service 1994a]).

57. Areas recently treated with herbicide should not be reentered, at a minimum, until the herbicide has dried. If the herbicide label specifies a reentry period, treated areas must be posted with signs warning visitors and others not to enter the treated area. The signs should indicate that the area has been treated with an herbicide, what materials were used, and the name and telephone number of a contact person. Also see design features #45 #62.

58. In areas in which members of the general public might consume vegetation/fruit where herbicides are intended to be used, the edible vegetation/fruit will be cut prior to being treated with herbicide. The intent is to reduce the risk of the public consuming herbicide treated vegetation/fruit.

59. Application will be restricted to the minimal effective dosage that, when precisely applied to the target area at optimum times, will accomplish the resource management objectives. Also see design feature #47.

60. High use areas, including administrative sites, developed campgrounds, visitor centers, and trailheads would be posted in advance of herbicide application or closed. Areas of potential conflict with public use will be prominently marked on the ground or otherwise posted at the site. Postings would indicate the date of treatments, the herbicide used, and when the areas are expected to be clear of herbicide residue. Also see design features #45 and #59.

2.6 How do the alternatives meet the project's purpose and need? What are the effects of implementing each alternative?

This section provides a summary of the effects of implementing each alternative. Table 10 provides a comparison of how well each alternative meets the purpose and need. Table 11 summarizes the effects of project activities by resource.

Detailed information on effects is located in Chapter 3 of this document.

Table 10. How each alternative meets the project purpose and need.

Purpose & Need	Alternative 1	Alternative 2	Alternative 3	Reference
Eradicate or control known weed populations	Least likely	Most likely	More likely	Sections 2.2.1, 2.3.1 and 2.3.2 Environmental Effects sections in Chapter 3
Treat new infestations quickly	No Each action would need a separate environmental analysis.	Yes With EDRR in place new infestations can be treated quickly using manual, mechanical and / or chemical treatments.	Yes With EDRR in place, new infestations can be treated quickly using manual and mechanical treatments.	Sections 2.2.1, 2.3.1 and 2.3.2 Section 2.4.2 Environmental Effects sections in Chapter 3
Protect non-infested areas	No	Yes	Yes, but less so than Alternative 2	Sections 2.2.1, 2.3.1, 2.3.2, 2.4.2, 3.2
Cost-effective weed treatment	25% + effective[1]	80% effective	25% effective	Sections 2.4.4, 2.4.5, 3.2.3

[1]Alternative 1 would be slightly more effective than Alternative 3 during implementation since herbicides could be approved for treatment.

Table 11. Comparison of alternatives

<table>
<tr><th></th><th>Alternative 1</th><th colspan="2">Alternative 2</th><th>Alternative 3</th></tr>
<tr><td>Treatment Methods</td><td>Small-scale manual and mechanical weed treatments would continue to be cleared by individual CEs. Herbicides limited to administrative and recreation sites.

No EDRR</td><td colspan="2">Herbicide, manual and mechanical

EDRR</td><td>Manual and mechanical

EDRR</td></tr>
<tr><td>Maximum annual treatment (acres/year)</td><td>103[1]</td><td colspan="2">200</td><td>200</td></tr>
<tr><td rowspan="2">Risk to Human Health</td><td rowspan="2">No risk</td><td>Imazapyr
Glyphosate
Adjuvants</td><td>Low risk</td><td rowspan="2">No risk</td></tr>
<tr><td>Aminopyralid</td><td>Negligible risk</td></tr>
<tr><td>Non-target vegetation (includes rare and sensitive plants)</td><td>No beneficial effects.

Possible negative indirect effects due to untreated weeds.</td><td colspan="2">Most beneficial alternative to non-target species and their habitat.</td><td>Limited beneficial effects to non-target rare plants and their habitat.</td></tr>
</table>

	Alternative 1	Alternative 2	Alternative 3
Soils	Adverse short-term impacts to soils and associated physical and biological components and processes. Adverse, long-term impacts to soils could increase due to continued growth of current infestations and establishment of new populations.	Adverse impacts – negligible, localized and short-term. Beneficial long-term effects	Adverse impacts - negligible to minor and short-term. No long-term effects
Wetlands	Short-term – no impact. Long-term – adverse impacts expected due to continued growth of current infestations and establishment of new populations.	Negligible, localized and short-term with long-term beneficial effects.	Negligible, localized and short-term with long-term beneficial effects.
Water quality and riparian condition	Short-term – No impacts Long-term – Moderate, adverse impacts resulting from expected spread of weeds, particularly reed canarygrass and brassbuttons.	Short-term – negligible, localized, potentially adverse impacts. Long-term – negligible, localized and beneficial impacts.	Short-term – Negligible, localized, potentially adverse effects due to soil disturbance from mechanical removal methods. Long-term – Minor, localized adverse effects in relatively large, infestation areas resulting from the expected spread of reed canarygrass and brassbuttons.
Aquatic Organisms	Short-term – negligible impacts Long-term – Negative impacts as weed populations grow	Short-term – Any impacts would be localized and most likely occur only at or very near the point the herbicide entered a water body. There could be some very localized effects to aquatic plants and algae with the use of imazapyr. Long-term – beneficial impacts expected as weed populations are reduced.	Short-term – negligible, localized, negative impacts due to repeated weed treatments. Long-term – potential beneficial impacts as weed populations are reduced

	Alternative 1	Alternative 2	Alternative 3
Wilderness Area Character	Presence and spread of weeds can adversely impact natural appearance.	Short term – Localized impacts to untrammeled, natural and opportunities for solitude or primitive and unconfined recreation Wilderness characters. Long-term – Increase in natural appearance	Short-term – Untrammeled and opportunities for solitude expected to decline due to repeated entries to treat weeds. Long-term – Decrease in natural appearance
Wildlife (population numbers and viability) Management Indicator Species Sensitive Species Threatened and Endangered Species Candidate Species	Short-term – None of the wildlife species are measurably affected by documented weed species. No adverse effects expected. Long-term – Possible future adverse effects if weed infestations are allowed to persist.	Negligible impacts. No impacts. Not applicable. There are no T&E species present. No impacts to black oystercatcher and dusky Canada goose; negligible impacts to Queen Charlotte goshawk.	Short-term, negligible effects. Long-term – Possible future adverse effects due to the inability to eradicate some weed species.
Treatment Cost/acre/year	$2,300	$2,300	$2,300
Subsistence	Negligible effects. None of the alternatives present a significant restriction of subsistence uses of deer, black bear, marten, wolf, otter, marine mammals, waterfowl, salmon, other finfish, marine invertebrates, fire wood, berries, and other resources.		
Recreation ROS Recreation Places and Sites	No effect. Short-term – No effect. Long-term – Reduced naturalness of the areas.	No effect. Short-term – possible displacement of visitors while treating area Long-term – Increased naturalness of the areas.	No effect. Short-term – possible displacement of visitors while treating area Long-term – Increased naturalness of the areas.
Roadless characteristics	Short-term – Little effect Long-term – Greatest adverse effects	Short-term – Little effect Long-term – Greatest beneficial effects	Short-term – Little effect Long-term – Beneficial effects
Cultural	No potential to affect historic properties.	Little potential to affect historic properties.	Little potential to affect historic properties.

[1]Based on the number of acres treated in the past 5 years.

Chapter 3. Environment and Effects

This chapter focuses on the environmental effects (direct, indirect, cumulative) and a brief summary of the affected environment (where applicable) for those resources that were concerns to the public and/or the interdisciplinary team during scoping. It also presents the scientific and analytical basis for Table 10 and the comparison of alternatives presented in Table 11. Several specialist reports are referred to in this chapter and they are all incorporated by reference.

Specialists have analyzed the most ambitious treatment scenarios for the action alternatives to provide a comparison of effects by treatment type. For Alternative 2, specialists analyzed the environmental effects of implementing the 200 acre/year treatment cap using herbicides exclusively and using manual and mechanical techniques exclusively. The result is an analysis of effects that doubles the number of acres proposed, and would be allowed, for treatment. For Alternative 3, specialists analyzed the treatment of 200 acres/year using only manual and mechanical techniques, with the exception of Section 3.2 (Weeds and Treatment Effectiveness) that looks at a maximum treatment of 100 acres/year. For both action alternatives, it is expected that the benefits and impacts of treatment would be less than the most ambitious scenario because funding, treatment caps, and other constraints will likely limit the acres treated in any one year.

The full analyses for each resource, including methods, assumptions and literature, are available as separate reports in the project record. Records from this file are available to the public (excepting specific exemptions to protect sensitive, private, or confidential records under the Federal Freedom of Information Act) upon request.

3.1 Human Health/Herbicide Toxicity

3.1.1 Introduction

The risk of proposed herbicide use to human health when exposed in a long-term scenario or in a short-term situation was identified as a public and internal concern.

The types of herbicide proposed for use are considered to have low toxicity levels and consequently the inherent level of health risk is minimal and readily mitigated through full compliance with worker training requirements, herbicide label stipulations and PDFs for safe herbicide storage, transportation, use and disposal.

Herbicide use has no direct beneficial effects to human health and safety. While herbicide use in Alternative 2 does carry a greater risk of effects than Alternatives 1 or 3, it provides an effective form of treatment for many weed populations. Combining the EDRR treatment strategy with herbicide while populations are small and scattered is expected to reduce overall treatment costs with less chemical use and possible effect to human health over the life of the project. There would also be fewer disturbances due to fewer entries than may be necessary with manual and mechanical treatments.

Potential adverse direct and indirect impacts are addressed for each herbicide and adjuvants in general. Cumulative effects are addressed for the herbicides generally based on projects that would utilize herbicides nearby and also for individuals who may be exposed to herbicides from other sources. Numerous design features have been added to this alternative to minimize risk and

potential harm to human health and safety for workers and the public. Table 12 provides a summary of the ratings of risk to human health and safety based on this analysis.

Table 12. Rating of risk to human health and safety for herbicides and adjuvants considered in Alternative 2.

Rating of risk	
Negligible	**Low**
Aminopyralid	Glyphosate
	Imazapyr
	Adjuvants

3.1.2 Affected Environment

Existing Condition

No threats to human health from past or ongoing herbicide use are known to exist in the project area. Most people are subject to some background level of chemical exposure; the most common known exposure is use of herbicide-based products for personal use (i.e., the use of Roundup®, which is a glyphosate based, commercially available herbicide, in gardening), or consumption of fruits or vegetables containing herbicide residue.

Currently the Alaska Department of Transportation (ADOT) in Wrangell and Petersburg use mowing, not herbicide treatments along the roads they maintain.

Desired Condition

The 2008 Land and Resource Management Plan (USDA Forest Service 2008b) provides direction to reduce population sizes and/or limit the spread of weeds on the Tongass National Forest using an integrated pest management approach, which includes the use of herbicides.

3.1.3 Environmental Effects

Methodology

The primary information evaluated in this analysis is based on laboratory and field studies of herbicide toxicity, exposure and environmental fate to estimate the risk of adverse effects to humans and non-target organisms. Formal risk assessments were done by Syracuse Environmental Research Associates, Inc. (SERA) using peer-reviewed articles from the available scientific literature and current Environmental Protection Agency (EPA) documents.

Additional information incorporated into this analysis is based on:

- Herbicide product labels;
- State of Washington, Department of Ecology aquatic pesticide website (http://www.ecy.wa.gov/programs/wq/pesticides/regpesticides.html); and
- State of Alaska, Department of Environmental Conservation (DEC) pesticide use website (http://www.dec.state.ak.us/eh/pest/index.htm).

Spatial and Temporal Context for Effects Analysis

Direct/Indirect/Cumulative Effects

The direct, indirect and cumulative effects from the use of any herbicide depends on the type (its toxic properties/hazards) and extent (the *level of exposure* to the herbicide at any given time, and the *duration of the exposure*). The spatial context for the analysis of effects of herbicides and herbicide treatment methods on human health includes the project area, and the cumulative effects analysis includes all non-National Forest System lands. The temporal context is seasonal for direct and indirect effects and over the life of the project (10 years) for cumulative effects.

The herbicides and herbicide treatment methods proposed in Alternative 2 present similar worker and public safety risks in the short-term (seasonally) and during the life of the project (10 years). Some of the activities considered in the effects analysis are:

1. the exposure that could occur during herbicide application (possibility from direct contact or ingestion);
2. the consumption of berries or inadvertently coming into contact with sprayed foliage after application; and
3. the potential for long-term (repeated/cumulative) exposure due to any herbicide use outside of National Forest System lands (e.g., people treating weeds on their own property, or other weed eradication projects that could potentially utilize herbicides).

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

The analysis of past, present and reasonably foreseeable activities in the project area considers management actions that may cumulatively affect human health. A project considered in the cumulative effects analysis is a Rural Advisory Committee (RAC) funded proposal to develop integrated management plans for invasive plants for the Wrangell and Petersburg Boroughs and the City of Kake.

All the projects evaluated for this analysis have been consolidated into a Catalog of Events, located in the project record, and available upon request.

Alternative 1 (No Action) and Alternative 3

Direct, Indirect and Cumulative Effects

No herbicide treatments are proposed with Alternatives 1 and 3; therefore, there would be no direct, indirect, or cumulative effects to human health related to herbicide use.

Alternative 2 – Proposed Action

This alternative proposes an integrated pest management approach, using all available treatment methods (manual, mechanical and chemical) in combination with an early detection-rapid response (EDRR) system of treatment within the project area. Early detection-rapid response is part of both action alternatives, and is considered in this effects analysis.

Herbicide treatments would be applied in accordance with label advisories, USDA Forest Service policies, Forest Plan management direction, human health and ecological risk assessments, and applicable project design features (PDFs) to minimize or eliminate adverse effects to human health.

The effects analysis for this alternative is specific to the use of herbicides.

Direct and Indirect Effects

The effects from the use of any herbicide depends on the toxic properties (hazards) of the herbicide, the level of exposure to the herbicide at any given time, and the duration of that exposure. With herbicide treatment methods proposed for Alternative 2, similar worker and public safety risks would exist for field activities, in addition to the handling and use of herbicides.

The Forest Service conducts risk assessments independent from EPA valuations for herbicide registration, focusing specifically on the type of herbicide uses in forestry applications. Forest Service contracted with Syracuse Environmental Research Associates, Inc. (SERA) to complete risk assessments for all the herbicides proposed for this alternative and they are incorporated by reference. In addition to the analysis of potential hazards to human health from every herbicide active ingredient, SERA risk assessments evaluate available scientific studies of potential hazards of other substances associated with herbicide applications, such as impurities, metabolites, inert ingredients and adjuvants. Papers addressing use of spray adjuvants with herbicides specific to conditions often used by the Forest Service are also included in this analysis, and they are incorporated by reference (Bakke 2003 and 2007).

Table 13 provides a general summary of hazard indicators and toxicity[8] categories for herbicides. Three herbicides are proposed in Alternative 2: aminopyralid, glyphosate, and imazapyr. A summary of worker and public health and safety is provided for each herbicide. Detailed information can be found in the Human Health and Safety Specialist Report for this project and in the SERA risk assessments. Specific application rates would vary with site-specific considerations and would stay within the range analyzed (see Table 9 in Section 2.4.5).

Table 13. General summary of hazard indicators and acute toxicity categories.

Hazard indicators	Acute toxicity categories (signal word)			
	I (Danger)	II (Warning)	III* (Caution)	IV (None required)
Oral LD_{50}**	Up to and including 50 mg/kg	50-0.2-2 mg/L 500 mg/kg	500-5,000 mg/kg	Greater than 5,000 mg/kg
Inhalation LD_{50}	Up to and including 0.2 mg/L	0.2-2 mg/L	2 to 20 mg/L	Greater than 20 mg/L
Dermal (skin) LD_{50}	Up to and including 200 mg/kg	200-2,000 mg/kg	2,000-20,000 mg/kg	Greater than 20,000 mg/kg
Eye effects	Corrosive; corneal opacity not reversible within 7 days	Corneal opacity reversible within 7 days; irritation persisting for 7 days	No corneal opacity; irritation reversible within 7 days	No irritation
Skin effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation at 72 hours

*The EPA classifies the end-use products (e.g., trade names Habitat® and Aquamaster®) containing imazapyr and glyphosate as category III and aminopyralid based products (e.g., Milestone®) as category IV.

** LD_{50} (lethal dose, 50 percent): Is the dose of a chemical calculated to cause death in 50 percent of a defined experimental animal population over a specified observation period. The observation period is typically 14 days.

[8] Toxicity is defined as the degree to which a substance is able to damage an organism.

Aminopyralid

Aminopyralid is registered by the EPA to control invasive plants. It is a selective, systemic, post-emergent herbicide that controls the entire plant, including the roots. Residual soil activity helps extend its ability to control target plants.

The EPA has judged that aminopyralid is a reduced-risk herbicide[9]. It would be applied at a lower rate when compared with other comparable herbicides[10]. Its residual action should reduce the need for repeat applications, resulting in a reduction in the amount of herbicides applied to the environment for the control of the project's targeted weed species (US Environmental Protection Agency 2005). The full range of the labeled rates (i.e., 0.03 to 0.11 pound of active acid equivalents[11] per acre [lb a.e./acre]) was considered as the lower and upper bounds on application rates in the SERA risk assessment (2007b) with the typical application rate at 0.078 lb a.e./acre or about 5 ounces of formulation per acre. The application range proposed in this project is 0.078 – 0.11 lb a.e./acre.

Science indicates that aminopyralid has low toxicity via oral (mouth), dermal (skin), and inhalation (breathing) routes of exposure. The toxicity categories for all hazard indicators are IV (US Environmental Protection Agency 2005). The weight-of-evidence suggests that aminopyralid may not have any remarkable systemic toxic effects. The effects most commonly seen involve effects on the gastrointestinal tract after oral exposure and these may be viewed as portal-of-entry effects rather than systemic toxic effects. Aminopyralid is rapidly absorbed and excreted and is not substantially metabolized in mammals.

The SERA risk assessment (2007b), along with the EPA, have determined there is no basis for asserting that aminopyralid is a carcinogen (US Environmental Protection Agency 2005). There is also no basis for asserting that aminopyralid would cause adverse effects on the nervous system, immune system or endocrine function. Based on studies completed on reproduction and development, the EPA concluded there is no evidence of increased qualitative or quantitative susceptibility of the fetuses to aminopyralid (US Environmental Protection Agency 2005).

The Office of Pesticide Programs of the EPA has derived a chronic (long-term) reference dose (RfD)[12] of 0.5 milligram of acid equivalent per kilogram of body weight per day (mg a.e./kg bw/day) for aminopyralid. For incidental (acute, short-term and intermediate exposures), the EPA has proposed an RfD of 1.0 mg a.e./kg bw/day or incident (US Environmental Protection Agency 2005). Based on the highest application rate for the various scenarios analyzed in the risk assessment, no adverse effects are likely in either workers or members of the general public (SERA 2007b). All plausible scenarios related to implementation of this project are below the level of concern.

The direct and indirect human health and safety hazard and risk for aminopyralid is negligible. This conclusion is based on the hazards (i.e., formulated end-use products highest toxicity category is IV; "not likely" to be carcinogenic; and no basis to assert aminopyralid would cause

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[9] A reduced risk herbicide is one that poses less risk to human health and the environment than existing conventional alternatives.

[10] Comparable herbicides include picloram, clopyralid, 2,4-D, dicamba, monosodium methanearsonate and metsulfuron methyl.

[11] Acid equivalent (a.e.) is the active part of the acid herbicide being used.

[12] Reference dose (RfD) is a numerical estimate of a daily exposure to the human population, including sensitive subgroups such as children, that is not likely to cause harmful effects during a lifetime. RfDs are generally used for health effects thought to have a threshold or minimum dose for producing effects.

an adverse effect on nervous system, immune system, endocrine functions, reproduction and development), dose response and risk characterization of longer-term and short-term exposure calculations being below the level of concern. Complying with the label instructions and design features incorporated in Alternative 2 would further lower these negligible risks.

Glyphosate

Glyphosate is a systemic, broad-spectrum, non-selective herbicide. It is quickly taken up by target plants and adheres to the soil which lessens or slows leaching and uptake by non-target plants.

There are currently 35 commercial formulations of glyphosate that are registered for forestry applications. This project would only utilize aquatic versions of any glyphosate-based herbicide products. The typical application rate would be about 2 lb a.e./acre, with application rates occurring over a range of 0.5 lb a.e./acre to 7 lb a.e./acre.

The available experimental studies indicate the primary hazard to humans involve potential contact of liquid to skin and eyes, and inhalation of vapors. Exposure may cause moderate irritation. In the case of eye exposure, the irritation level is similar to detergent exposure. Reviews conducted by SERA (2011b) concluded very little indication of any potential risk at the typical application rate of 1 lb a.e./acre. Even at the upper range of plausible exposures in workers, most hazard quotients are below the level of concern. The available experimental studies indicate glyphosate is not completely absorbed after ingestion and is poorly absorbed after skin exposure.

There is no clear pattern suggestive of a specific neurotoxic action for glyphosate or its commercial formulations. The weight of evidence suggests any neurologic symptoms associated with glyphosate exposures are secondary to other toxic effects. No studies are reported that suggest an effect on the immune system. Glyphosate has not undergone an extensive evaluation for its potential to interact or interfere with the estrogen, androgen or thyroid hormone systems but tests show no potential effects of glyphosate on the endocrine system. According to the risk assessment (SERA 2003), there is no basis for asserting that glyphosate is likely to pose a substantial carcinogenic risk. Hardell and Erikson (1999a as referenced in SERA 2003) reported an increased cancer risk of non-Hodgkin lymphoma (NHL) in individuals in Sweden who have a history of exposure to glyphosate. The EPA, Office of Pesticides Programs Health Effects Division, has reviewed the journal article entitled "A Case-Control Study of Non-Hodgkin Lymphoma and Exposure to Pesticides" and concluded the study does not change the EPA's risk assessment for the currently registered uses of glyphosate. It was determined this type of epidemiologic evaluation does not establish a definitive link to cancer. Furthermore, the information had limitations because it is based solely on unverified recollection of exposure to glyphosate-based herbicides (US OPP-EPA 2002 as referenced in SERA 2003).

A recent study indicates that Roundup® formulations directly applied to human umbilical, embryonic and placental cells have adverse effects (cell damage and/or death within 24 hours). The study concluded glyphosate with the adjuvants used in Roundup® (e.g., Polyoxyethyleneamine [POEA]) synergistically caused greater damage to cells than glyphosate alone (Benachour and Seralini 2009).

To avoid the synergism between glyphosate and adjuvants, Alternative 2 proposes only aquatically labeled formulations of glyphosate (e.g., Aquamaster®) and low-risk aquatically approved surfactants (e.g., Agri-Dex®, Class Act® NG®, Competitor®.) This feature eliminates potential impacts from surfactants that have high levels of POEA.

As noted in the risk assessment for this herbicide, it is unlikely an individual would consume contaminated vegetation over a 90-day period within the project area (chronic scenario). The levels would be reduced below the level of concern by notifying the public so they are aware that herbicide treatment has occurred (see PDFs in Section 2.5.2).

Imazapyr

The most common and effective applications for imazapyr are post-emergent when the vegetation is growing vigorously. The typical application rate for imazapyr would be about 0.45 lb a.e./acre with rates up to 1.25 lb a.e./acre. Addition of a non-ionic surfactant is recommended to enhance efficacy of the imazapyr-based end-product (Habitat®). The lowest risk surfactants available would be used in (e.g., Agri-Dex®, Class Act® NG®, Dyne-Amic®, Competitor®).

Although the mode of action of imazapyr in humans or other mammals is unclear, this is partly due to the apparently low and essentially undetectable acute and chronic (short- or longer-term) systemic toxicity of this compound. An adequate number of multi-generation reproductive and developmental studies have been conducted and the studies show no adverse effects on reproductive capacity or normal development. Tests of carcinogenic and mutagenic activity are consistently negative, and the EPA has categorized the carcinogenic potential of imazapyr as Class E: evidence of non-carcinogenicity. There have been many long-term animal studies. Though none focused on the immune system, the results do not indicate imazapyr would adversely affect the immune system. The weight of evidence suggests that imazapyr is not directly neurotoxic, and the available data do not show systemic toxic effects after skin or inhalation exposures to imazapyr.

RfD of 2.5 mg/kg/day is used to characterize the risks of both short-term (acute) and longer-term (chronic) exposures and is the basis of determining the level of concern. Upper level exposures at the highest application rate estimated for Alternative 2 do not lead to estimated doses that exceed a level of concern for workers (SERA 2011a).

Imazapyr and imazapyr formulations can be mildly irritating to the eyes and skin. Mild irritation to the eyes can result from exposure to relatively high levels. From a practical perspective, eye irritation is likely to be the only overt effect as a consequence of mishandling imazapyr. This effect can be minimized or avoided by prudent industrial hygiene practices (e.g., exercising care to reduce splashing and wearing goggles) when handling the compound. These measures are included in the design features for this alternative (e.g., personal protective equipment, spill kit).

Based on this analysis, the human health and safety hazard and risk for imazapyr is low. This conclusion is based on the hazards (i.e., formulated end-use products highest toxicity category is III, caution, no basis to assert imazapyr is carcinogenic or that it would cause an adverse effect on nervous system, reproduction and development) and dose response and risk characterization (i.e., all scenarios for workers and public, chronic and acute exposures were below the level of concern). Complying with the label instructions and design features would further lower the minimal risks.

Additives (adjuvants, surfactants and inert ingredients) and Impurities

Herbicides generally need to be applied with an adjuvant, compounds added to the herbicide formulation to improve its performance. There are several types of adjuvants including surfactants, non-foaming agents and colorants.

Surfactants help make an herbicide more effective by increasing absorption into the plant. Surfactants may also improve an herbicide's efficiency so the concentration or total amount of herbicide required to achieve a given effect is reduced, sometimes as much as five or ten-fold (Tu et al. 2001). In this way, adding an appropriate surfactant can decrease the amount of herbicide applied and lower total costs for weed control (Tu et al. 2001). In some cases, the herbicide would already have the surfactant included, but in others, it would be necessary to add one.

Adjuvants are not under the same registration guidelines as herbicides, and the EPA does not register or approve the labeling of adjuvants. The State of Alaska DEC also does not have an approved adjuvant list. This project references the adjuvants approved for aquatic use in the State of Washington (http://www.ecy.wa.gov/programs/wq/pesticides/regpesticides.html).

This project will use only low-risk aquatically approved surfactants (e.g., Agri-Dex®, Class Act® NG®, Competitor®). This feature would eliminate potential impacts from surfactants that have high levels of POEA, which at high levels can have adverse effects to aquatic wildlife species.

Many of the inert ingredients in adjuvants are proprietary in nature and have not been tested on laboratory species. However, confidential business information (i.e., the identity of proprietary ingredients) was used in the preparation of the herbicide risk assessments and adjuvants are considered in the overall effects reported for this project.

Impurities are inadvertent contaminants in the herbicide, usually present as a result of the manufacturing process. The risk assessments describe the impurities and their risks.

Other adjuvants include defoamers and colorants. Defoamers are used to reduce the foaming that might occur during agitation of the spray mixture. Colorants can be added to herbicide solutions to enable spray crews to see where they have sprayed after initial evaporation of the solution.

Early Detection / Rapid Response (EDRR)

The effect of herbicide treatments on human health under EDRR would not exceed the minimal effect predicted for the most ambitious treatment scenario (200 acres/year for 10 years) and would be sufficiently minimized by the PDFs regardless of when the treatments occurred. Combining the EDRR treatment strategy with herbicide while populations are small and scattered is expected to reduce overall treatment costs with less chemical use and possible effect to human health over the life of the project.

If effective treatments of new infestations require herbicide treatments outside the scope of the project, or if PDFs could not be applied without a significant loss of effectiveness, further analysis would be required.

Cumulative Effects

Cumulative effects from the use of herbicides on human health include the potential use of herbicides in a proposed non-national forest weed management plan for the communities of Petersburg, Wrangell and Kake. Additionally workers and the general public within the project area could use some of the proposed herbicides outside the project area (e.g., treating weeds on their own property). Glyphosate likely has the highest risk for cumulative effects because it is the most common herbicide sold to the general public to treat weeds. Currently the Alaska Department of Transportation (ADOT) in Wrangell and Petersburg use mowing, not herbicide treatments along the roads they maintain.

Overall, herbicide use associated with Alternative 2, even at full implementation, would contribute no measurable effects when combined with the effects of other past, present and reasonably foreseeable future activities. To further minimize the cumulative risk of herbicide use on human health and safety PDFs have been developed and will be implemented as necessary.

3.1.4 Design Features and Mitigation Measures

The project design features (PDFs) listed in Section 2.5.2 apply to the use of herbicides and constrain the rate and method of herbicide use to such a degree that the likelihood of adverse effects is low. Adverse effects from acute, multiple or chronic exposures are unlikely. Chronic exposures do not exceed thresholds of concern because the proposed herbicides are excreted from organisms so rapidly they do not accumulate over time, or are used at such low application rates, and in a selective manner, overexposure is unlikely.

3.1.5 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All projects involving applications of herbicide on National Forest System land require approval of a Pesticide Use Proposal (PUP). The PUP process ensures compliance with Forest Service policy and applicable laws. It also may identify additional site- or project-specific requirements.

Where a project evaluation indicates potential for over-water application (including seasonally flooded, temporarily flooded or saturated riparian or wetland sites), the Forest Service is required to apply for a permit with the Alaska Department of Environmental Conservation (ADEC) per regulation 18 AAC 90.505 (ADEC 2013d). Additionally, implementation of any herbicide application to and near waters of the U.S. require approval of a Pesticide General Permit by the EPA.

Project implementation will follow Forest Plan Standards and Guidelines for Pesticide Use and Vegetation Management (USDA Forest Service 2008b, p. 4-75).

3.2 Weeds and Treatment Effectiveness

3.2.1 Introduction

Issues identified for this project are linked to the effects of herbicides and other weed treatment methods on natural resources, such as fish, water, wildlife, Wilderness character and non-target plant species. Unlike these resources, weeds are the impetus behind the Proposed Action. As such, weeds were not specifically identified as an issue either from internal or external comments during the scoping period. The issue of weeds is predominantly an internal one directly linked to the Tongass National Forest Land and Resource Management Plan (2008c) desired condition for biodiversity. This project would move the project area toward the desired condition (see Section 1.3).

3.2.2 Affected Environment

Invasive Plants and their Impact on Special Places

Field inventories have identified 62 different weeds, both invasive and other non-native plant species (approximately 517 acres of infestation), within the boundaries of the 3.6 million-acre project area. Twenty-three of these species, totaling approximately 441 acres, are target weeds, meaning they are the species of greatest concern on the Petersburg and Wrangell Ranger Districts

(see Table 1). Infestations range in size from less than 1 acre to 168 acres. The Hydrology resource report for this project (Whitacre 2013) displays acres of inventoried weeds for each treatment area (treatment areas are synonymous to 6^{th} level hydrologic unit, or sub-watershed). Most weeds are predominantly located in disturbed areas: along road systems and within rock pits, at administrative sites, and in areas utilized for recreation such as campgrounds, dispersed recreation, cabins and trails. These areas are identified as "site types" for this project (see Section 2.4.3). While most of the infestations are in disturbed areas (many weeds do not grow well under a forest canopy), weeds such as creeping buttercup and orange hawkweed can occupy and even thrive in forested settings. Table 3 shows weed acres by site type.

Vectors for Weeds (Pathways of Spread)

Roads are conduits for the spread of weeds, providing for their transport and dispersal (e.g., seeds and vegetative reproductive parts attached to vehicles) and providing disturbed ground for easy colonization and establishment. Petersburg and Wrangell forest system roads and trails may also serve to introduce weeds onto the Wilderness areas where native plant communities and ecological integrity are highly valued. However the Wilderness areas in this project are not close to any existing roads, with the possible exception of the Portage Bay road system on the mainland and the Etolin Island road systems. Roads serve to introduce and establish weeds in areas where they were previously unknown. For example, giant hogweed has been found (and is being treated) within the city of Kake. These control measures are especially important because giant hogweed has not yet spread to Tongass National Forest System lands.

Timber harvest, road building, and other ground-disturbing activities occur on National Forest System lands and contribute to the spread of weeds, as the habitat conditions that facilitate colonization are created, such as changes in sun exposure and/or soil disturbance that result. Recreation activities (e.g., hiking, camping) can spread weeds along trail systems and at remote and developed recreation sites. In addition, weeds are spread through the movement of water in creeks and across wetlands. Floods move weed seed and materials into adjacent riparian areas.

Intentional and accidental introductions have primarily occurred over the past century, but major introductions have occurred most rapidly over the past 50 or 60 years. Introductions of plants for erosion control along road systems contribute to the number of weeds slated for treatment. In addition, and to a lesser degree, other site-specific erosion control measures (e.g., landslide stabilization) have occurred using now undesirable species throughout National Forest and adjacent public and private lands in the project area. The weeds introduced for horticultural use by nurseries and individuals have predominantly been intentional. Commercial landscape nurseries or other vendors (such as grocery stores in local communities) that sell, or once sold, exotic species for domestic landscaping have been found to be invasive (e.g., ornamental reed canarygrass, lady's mantle, English ivy and Scotch broom). While most ornamental plants have not yet spread to federal lands, the potential for them to do so is real.

On the Tongass National Forest, weeds have displaced native vegetation and disrupted the functioning of plant communities in some important areas, including (but not limited to):

- Meadow systems: Reed canarygrass along the Stikine River
- Wilderness areas: Brassbuttons occupy about 105 acres of shorebird habitat in Petersburg Creek – Duncan Salt Chuck Wilderness area
- Riparian Area: Reed canarygrass along Saginaw Creek

Without treatment, weeds may displace important native plant communities and spread to new areas. In recent years, acres of weeds have increased. In the Pacific Northwest, the average rate of spread is about 5-15 percent per year (USDA Forest Service 2008a). In Southeast Alaska, rate of spread may be lower due to factors such as number of cloudy days, remoteness of the area and lack of connectedness to road systems, coupled with the relatively intact ecosystem integrity of the Tongass. For the purposes of this analysis, rate of spread is estimated at 10 percent. Prevention practices are intended to reduce the total acres of weeds; however, as populations increase in number and size, they become more difficult and costly to control.

Current Weed Inventory

Most of the weed data in the project area was derived from a contract survey that occurred in the summer of 2006, under the administration of the Alaska Regional Office. These surveys covered Revillagigedo, Wrangell, Mitkof and Kupreanof Island road systems (Arhangelsky 2006). Forest Service personnel on the Petersburg Ranger District conducted similar surveys in 2007, 2008, 2010 and 2012. Other non-native plant surveys throughout the ranger districts have occurred in concert with other program activities, namely Wilderness monitoring, recreation facilities inspections, timber sale projects and other special use permit applications.

The goal of the 2006 surveys was to assess the extent of non-native plant populations on Revillagigedo (not currently in this project area), Wrangell, Mitkof, and Kupreanof Islands and to identify areas of particular concern. Field data on non-native plants was collected on road right-of-ways on state and local lands and Forest Service controlled road right-of-ways on private land. Four-hundred and forty miles of road were surveyed using the Alaska Exotic Plants Mapping Program (AKEPIC) survey protocol (see http://aknhp.uaa.alaska.edu/botany/akepic) (Arhangelsky 2006). Forest Service roads identified for the survey were designated as maintenance levels 3 and 4 (suitable for passenger car and moderate degree of user comfort). The reasoning was to capture areas of heavier use with a higher susceptibility to invasion by non-native species.

The 2006 surveys recorded 92 non-native species along the roads and adjacent disturbed areas. The survey areas that typically had the greatest weed diversity were residential areas, towns, paved state roads and rock pits. With some notable expectations around Kake, the diversity was at its highest in these areas and then decreased with distance. This trend is also apparent on Forest Service spur roads; diversity is at its highest at the junction with paved state roads, and then systematically decreases with distance.

The most common species encountered on roads of all jurisdictions were reed canarygrass (*Phalaris arundinacea*), Timothy grass (*Phleum pretense*), all three clovers (*Trifolium* spp.), common plantain (*Plantago major*), and common dandelion (*Taraxacum officinale*).

Target Species List

Not all populations of weeds would be treated during the life of the project. A prioritization strategy was developed (see Section 2.4.4) which identifies where to focus treatment efforts (what to treat, where to treat, and the management objective of the site). Based on the results of the surveys that occurred within the project area, the first order of the treatment strategy is to identify which non-native plant species to treat (the target species).

The target species list (see Table 1 in Section 2.2.1) identifies the weed species proposed for treatment within the project area. Additionally, a watch list (Table 6) identifies highly invasive plants not currently known to occur on the National Forest System lands within the project area.

Treatment Effectiveness

Treatment effectiveness increases with the number of treatment options available and the percentage of the infested land base that may be treated using herbicides. All alternatives approve a wide-range of non-herbicide methods, including manual and mechanical treatments. The variation between alternatives is mostly related to the use of herbicides. For the purposes of this analysis, all herbicide application methods (hand and spot) are considered equally effective. Broadcast application methods are not considered as a treatment option in this analysis. Funding constraints and conditions on neighboring lands may also influence treatment effectiveness; these variables are constant across alternatives.

The spread of weeds is not continuous or even across the landscape. Weeds can "jump" across far distances. For example, a vehicle can deposit seeds or propagules in another city or natural area where it might be otherwise unknown. Hikers are likely to deposit weed seeds along the trail into dispersed recreation sites within the Wilderness. The hazard related to invasion of non-infested areas and high value areas like Wilderness may be much greater than the hazard related to weed spread elsewhere.

Manual and Mechanical Treatments

Manual and mechanical treatment methods are approved in all alternatives. These treatments are preferred where effective (consistent with treatment strategies), particularly where impacts (disturbance, compaction) from use of motorized equipment can be minimized. The effectiveness of manual and mechanical treatments increases if herbicides are also available for use (Alternative 2 only). However, if herbicide use is not allowed (as in Alternative 3), stand-alone manual and mechanical treatments may increase rather than decrease population numbers. While actual effectiveness monitoring has yet to get underway on the Tongass National Forest, this analysis uses a 25 percent effectiveness factor for manual and mechanical treatments based on findings from other national forests in the Pacific Northwest (USDA Forest Service 2008a).

For instance, manual and mechanical treatments can increase populations of Canada thistle and Japanese knotweed as pieces of rhizome/root/stem break off and develop into a plant the following spring. Also, in the process of digging/pulling, the disturbance creates ideal habitat conditions for weed seeds to germinate and flourish. In order for manual/mechanical to be effective for these species, meticulous follow-up is necessary several times in a growing season for at least 5 years, to prevent seeds from being produced and dispersed, and to kill any germinants. In contrast, annuals may be effectively pulled out of the ground by hand (manual treatment) because of their 1-year life cycle.

Herbicide Treatments

More herbicide options tend to result in greater potential effectiveness; fewer options tend to result in lower potential effectiveness (USDA Forest Service 2008a). Each weed species has its own physiology, and its own habitat requirements. Herbicide effectiveness varies substantially depending on the weed species, treatment timing, restoration plans, and environmental factors. In Chapter 2, Table 8 (Common control measures by target weed species) shows the measures considered most effective for the weed species documented on the Tongass National Forest. While actual effectiveness monitoring has yet to get underway on the Tongass National Forest, this analysis uses an 80 percent effectiveness factor for herbicide application based on the findings from other national forests in the Pacific Northwest (USDA Forest Service 2008a).

A range of herbicide and non-herbicide options is necessary to effectively treat weeds. For instance, the herbicide aminopyralid does not work effectively for all species of weeds. Aminopyralid is best used for broadleaf vegetation, but other herbicides such as imazapyr are more effective for grasses and other non-broadleaf plants. Glyphosate has more restrictions for effective use. For instance, glyphosate is only effective in the fall after seed production for some plants, whereas imazapyr will provide effective treatment any time of year. In addition, a number of weeds nationwide have developed a tolerance to glyphosate, and its effectiveness has been markedly reduced (USDA Forest Service 2008a).

The percentage of the land-base that would be treated varies between alternatives. The more acres left untreated, the greater the likelihood weeds would spread and compete with native plant communities (for example, in Alternatives 1 and 3). Thus, another indicator of effectiveness is the acreage of weed infestations projected ten years from now. A 10 percent increase in weed populations per year has been applied to calculate the total acres of weeds during the life of the project.

Desired Condition

The issue of weeds is predominantly an internal issue directly linked to the Tongass National Forest Land and Resource Management Plan (2008c) desired condition for biodiversity. This project would move the project area toward the desired condition which states the following:

> "Viable populations of native and desired nonnative species and their habitat are maintained and are not threatened by invasive species…."

Also, the issue of weeds is further addressed in the following Forest Plan Goals and Objectives:

> Biodiversity Goal (p. 2-4), "Maintain ecosystems capable of supporting the full range of native and desired nonnative species and ecological processes. Maintain a mix of representative habitats at different spatial and temporal scales."
>
> > Objective (c), "Manage the Forest in order to reduce, minimize, or eliminate the potential for introduction, establishment, spread, and impact of invasive species."
>
> Wilderness Goal (p. 2-8), "Manage designated Wilderness to maintain an enduring wilderness resource while providing for the public purposes of recreational, scenic, scientific, educational, conservation, and historical use, as provided in the Wilderness Act of 1964 and ANILCA."
>
> > Objective, "Preserve and perpetuate biodiversity. Inventory and reduce or eliminate invasive species in Wilderness."

Specifically for the Tongass National Forest, the Invasive Plant Management Plan (Lerum and Krosse 2005) describes four categories of immediate foreseeable and long-term desired conditions which are addressed within four emphasis areas of weed management:

1. Prevention – stop invasive species before they arrive: New introductions of invasive plants are prevented and infestations of established invasive plants are contained.

2. Early Detection and Rapid Response – find new infestations and eliminate them before they become established: New occurrences of targeted invasive plants are detected and eliminated before becoming problematic.

3. Control and Management – contain and then reduce existing infestations: Infestations of invasive plants are eradicated, controlled (ongoing suppression), or contained (outlying infestations are eradicated). Existing infestations of targeted species are reduced.

4. Rehabilitation and Restoration – reclaim native habitats and ecosystems: Ecosystems affected by invasive species are effectively restored or rehabilitated to desired conditions and to conditions that reduce vulnerability to invasion or reinvasion by invasive plants.

3.2.3 Environmental Effects

The timeframe for this project is 10 years; therefore, this analysis provides data for projected treatment acres for each year over the next 10 years. The 2,000-acre treatment cap is based on the assumption that as new areas are inventoried, more weeds will be found and/or existing infestations will continue to spread and takes into account the EDRR component of the project.

The direct, indirect and cumulative effects of weed treatments are covered by the resource areas affected by the treatments (see wildlife, Wilderness, hydrology, aquatic organisms, etc.).

Methodology

The methods used to evaluate the effectiveness in meeting the purpose and need of this project relative to weed management are as follows:

1. Treating the fewest acres of weeds over the life of the project (10 years) while meeting the desired condition of eradication, containment and control strategies for all currently known target weed infestations on the project area (treatment acres/year) using the treatment methods approved within each alternative. This element is addressed in direct and indirect effects section.

2. Reducing target populations each year (percent decrease).

3. Treatment effectiveness (number of new treatment acres/year). This is based on an effectiveness factor of 80 percent for herbicide treatments and 25 percent for manual and mechanical treatments (USDA Forest Service 2008a).

Information used in this analysis was derived from the Tongass National Forest Geographical Information System (total acres of weeds by species by project area) and information on past treatments was derived from the Forest Service Activity Tracking System (FACTS).

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

District-level categorical exclusions (CEs) have been completed on the Wrangell Ranger District which allowed for chemical, manual and mechanical treatment on Forest Service developed sites (administrative sites, ranger district offices, work camps and other federally-owned properties) and recreation sites (cabins, trails, campgrounds). Other small treatment efforts have occurred throughout the project area involving repeated hand pulling, clipping and/or tarping of small roadside infestations of high-priority species, such as bull thistle and orange hawkweed. Between the years 2008-2012, approximately 1 acre/year of treatment with herbicide occurred, along with about 102 acres/year of manual/mechanical treatment (the majority of treatment acres occurred in one site on the Petersburg Ranger District).

In addition, some manual treatment efforts involving partnerships with the Sitka Conservation Society, Southeast Alaska Guidance Association (SAGA) and Youth Conservation Corps (YCC) have occurred over the past 5 years, particularly in Wilderness areas. The largest effort has occurred in Duncan Canal, near the Petersburg Creek-Duncan Canal Wilderness on the Petersburg Ranger District. From 2009-2012, an average of about 90 acres/year of manual treatments occurred in that area. Additionally, small and scattered manual treatments in the Stikine-LeConte Wilderness have occurred, averaging about 2 acres/year.

Treatments have generally been effective in decreasing the total area of infestation or in containing the population to within its original boundaries. However, all of the manual treatments used for species such as bull thistle, brassbuttons and orange hawkweed needed repeat treatments annually, and are not very cost-effective since it takes many years to reach the treatment strategy.

The projects considered in the cumulative effects analysis are consolidated in the Catalog of Events and summarized in the Sensitive and Rare Plant resource report (Dillman 2013), both located in the project record.

Effects Common to All Action Alternatives

Early Detection-Rapid Response

All action alternatives include the ability for National Forest System land managers to approve treatments on currently unknown weed infestation sites assuming project design features would be followed. The premise of early detection-rapid response (EDRR) analysis is that treatments of new infestations would have similar effects to treatments of existing sites.

The effects analysis for each alternative (see the next section) is based on the currently known target weed infestations and does not include the EDRR concept.

Effects by Alternative

Alternative 1: Current Condition Scenario

Under Alternative 1, the treatment program for the Petersburg and Wrangell Ranger Districts would continue in a similar manner as the past 5 years. This includes a continuation of weed treatments cleared in other NEPA documents (e.g., CEs for weed treatments at administrative and recreation sites). Alternative 1 would not preclude future weed management in the project area. This alternative represents the existing condition and expected future conditions (in the absence of treating any new infestations) and serves as a baseline to compare the effects between alternatives. It assumes that only those weed infestations currently being treated would continue to be treated.

Direct Effects and Indirect Effects

For the purposes of analysis, Alternative 1 assumes 103 acres are treated in Year 1 (1 acre with spot/hand herbicide application followed by manual and mechanical treatment, plus 102 acres of manual and mechanical treatment). For all but 1 acre which receives herbicide treatment, 25 percent of the treated acres are assumed restored based on the estimated effectiveness of manual treatment methods (USDA Forest Service 2008a). In addition, 10 percent/year is added to the infested acres to account for the increase in population size every year (Table 14).

In terms of direct effects, a total of 489 acres of weeds would be treated over a period of 10 years. Each year, a net decrease in treatment acres would occur, with 103 acres treated in Year 1, ending

with 13.6 acres treated by Year 10. No additional weed infestations would be treated other than those acres previously treated over the past 5 years. This is the most ambitious treatment scenario for Alternative 1.

Annually, the target weed infestations treated would decrease at a rate of approximately 25 percent per year. However, the remaining 311 acres of target weed infestations not treated would continue to grow and spread resulting in approximately 895 acres of weeds by Year 10: a two-fold increase in total weed infestation acres from the original 441 target acres.

Alternative 1 would not require an increase in annual funding because this alternative does not propose to treat additional acres over what is currently being treated. In fact, annual funding levels are expected to decline as the acres currently being treated are reduced.

Table 14. Annual treatment scenario for Alternative 1 (current condition)[1]

Treatment scenario	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total acres treated	103	84.4	69.6	57.4	47.4	39.1	32.2	24.2	18.1	13.6
Acres treated with herbicide	1.0	0.2	0	0	0	0	0	0	0	0
Acres treatment with non-herbicide	102	84.2	69.6	57.4	47.4	39.1	32.2	24.2	18.2	13.6
Acres restored	26.3	21	17	14	12	10	8	6	5	3

[1] Years 2 and following include a 10 percent increase in population size due to rate of spread.

Summary

Desired conditions for this project and for the 2008 Forest Plan would not be met, since only those infestations currently being treated would continue to be re-treated over the next 10 years. As such, this does not meet the desired condition of treating other priority infestation areas.

Weed populations would continue to increase with little or no treatment efforts during and after the life of this project, meaning the remaining untreated acreage in the project area of currently known priority infestations would continue to spread. Assuming a spreading rate factor of 10 percent per year, this equates to approximately 895 acres of weed infestations by the year 2022[13].

Cumulative Effects

The cumulative adverse effects of weeds on all resources considered in this chapter are expected to increase in the long-term due to the alternative's inability to: treat new infestations quickly (i.e., no EDRR and the completion of a separate environmental analysis for each action); eradicate or control known weed populations; protect non-infested areas; and provide cost-effective weed treatment.

Two Resource Advisory Committee (RAC) projects proposed in the project area specifically address weed concerns. One project involves developing weed management plans for non-federal lands in and around Kake and the Petersburg and Wrangell boroughs. The project is ongoing and has been contracted to the Alaska Association of Conservation Districts. The second project proposes weed control (specifically reed canarygrass) in the Stikine-LeConte Wilderness area. Both of these projects have the potential to help manage weeds within the project area.

[13] See Appendix A of the Non-native Plants resource report in the project record for calculations.

The past, present and reasonably foreseeable projects evaluated for this analysis have been consolidated into a Catalog of Events, located in the project record.

Alternative 2: Annual Treatment Scenario: Herbicides as Primary Treatment Method

Under this alternative, 200 infested acres would be treated with herbicides in Year 1 as the most ambitious treatment possible. Of those 200 acres, 80 percent (160 acres) of the infested area would be reduced, based on a general herbicide treatment effectiveness rate (USDA Forest Service 2008a). In Year 2, another 200 acres would be treated, with 44 acres considered re-treatments (this includes a 10 percent increase in populations size per year) and 156 acres of new treatments (Table 15).

Direct Effects and Indirect Effects

A total of 610 acres of weeds would be treated over a period of 10 years. Each year, a net decrease in treatment acres would occur, with 200 acres treated in Year 1, ending with 2 acres treated in Year 6. By Year 7, no additional treatments would be necessary, as the original 441 acres of target weeds, plus the acres due to annual spread, would be eradicated. This is the most ambitious treatment scenario for Alternative 2.

Annually, the target weed infestations within the project area would decrease at a rate of approximately 30 percent in Year 1, followed by 50 percent by Year 2, 80 percent in Years 3 and 4 and 100 percent by Year 6. The annual rate of decrease in total weed infestations would be higher each year as the total weed acres restored outnumber the total weeds remaining.

This alternative assumes no other weed infestations are found within the project area. In reality, some infestations may still need to be treated after 6 years if there is a persistent seed bank. As weed populations get significantly smaller, non-herbicide methods would become more cost-effective. Thus, the proportion of non-herbicide compared to herbicide methods would increase over time in the alternative.

Table 15. Annual treatment scenario for Alternative 2 (herbicide as a primary treatment method[1])

Treatment scenario	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total acres treated	200	200	164	36.1	7.9	2.0	0	0	0	0
Acres treated with herbicide	200	200	164	36.1	7.9	2.0	0	0	0	0
Acres treatment with non-herbicide	0	0	0	0	0	0	0	0	0	0
Acres restored	160	160	131	29	6	2.0	0	0	0	0

[1] Years 2 and following include 10 percent increase in population size due to rate of spread.

Summary

The desired conditions would be met for this project and for the 2008 Forest Plan, since weed infestations would be treated and infestation acres would decrease over time. This alternative would cost less to reach the desired condition than any other alternative proposed in this project[14].

[14] See Krosse 2013a, Cost Analysis resource report; located in the project record.

Cumulative Effects

The cumulative adverse effects of weeds on all resources considered in this chapter are expected to decrease in the long-term due to the alternative's ability to: treat new infestations quickly (as a result of EDRR and an approved weed management plan); eradicate or control known weed populations; protect non-infested areas; and provide cost-effective weed treatment.

Two Resource Advisory Committee (RAC) projects proposed in the project area specifically address weed concerns. One project involves developing weed management plans for non-federal lands in and around Kake and the Petersburg and Wrangell boroughs. The project is ongoing and has been contracted to the Alaska Association of Conservation Districts. The second project proposes weed control (specifically reed canarygrass) in the Stikine-LeConte Wilderness area. Both of these projects, in conjunction with the Proposed Alternative, have the potential to provide more extensive weed management within the project area.

The past, present and reasonably foreseeable projects evaluated for this analysis have been consolidated into a Catalog of Events, located in the project record.

Alternative 3: Annual Treatment Scenario: Manual and Mechanical Control

A treatment program using only manual and mechanical methods would be available for a maximum number of treatment acres per year over the life of the project. The maximum acres treated per year would be 100. The rationale for 100 acres for this alternative is based on the reality that it is unlikely the Forest Service would be able to manually treat more given the constraints of funding (Krosse 2013a).

The effectiveness factor for manual and mechanical treatment is 25 percent (USDA Forest Service 2008a). Consequently, each year, 25 percent fewer acres would need re-treatment (approximately 25 acres of the original 100). Given the 10 percent spread factor for the remaining 75 percent, coupled with the target weed acres left untreated, each year would result in a 100 acre/year program of work. In Year 2, another 100 acres would be treated, with 75 of those acres considered re-treatments and 25 acres of new treatments. A similar scenario would follow into Year 3 and beyond. This would result in a never-ending treatment program of work (Table 16).

Direct and Indirect Effects

Alternative 3 assumes a total of 1,000 acres of weeds would be treated; 100 acres/year over a 10-year period. The untreated acres of target weed infestations would continue to spread at a rate of approximately 10 percent a year, resulting in a 38 percent increase in total weed infestation acres (706 acres) by Year 10.

Under Alternative 3, the weed treatments would never end and would require an annual increase in funding of approximately 25 percent over the 10-year period. The indirect effects of this alternative are addressed in other resource sections of this chapter since an incomplete suite of treatment options (no use of herbicides) may affect the ecological character and resource functions due to the fairly low effectiveness of manual and mechanical treatments.

Table 16. Annual treatment scenario – Alternative 3 (manual and mechanical treatment methods)

Treatment scenario	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total acres treated	100	100	100	100	100	100	100	100	100	100
Acres treated with herbicide	0	0	0	0	0	0	0	0	0	0
Acres treatment with non-herbicide	100	100	100	100	100	100	100	100	100	100
Acres restored	25	25	25	25	25	25	25	25	25	25

Summary

Based on the current inventory of approximately 441 acres of target weeds known to occur in the project area, coupled with a 10 percent rate of spread estimate, the desired conditions for all known infestations would not be achieved over the 10-year life of the project. By Year 10, there would be no net loss of weeds; rather there would be a net increase, even with an estimated 250 acres of effective treatments over that period of time.

The desired conditions for this project and for the 2008 Forest Plan would likely never be met, since weed infestations would continue to spread at a rate which results in a net increase in total weed infestation acres. However, reaching the desired treatment strategy of control and containment for some weeds and eradication for others may be possible during the 10-year life of this project. This alternative would cost more than the other alternatives proposed in this project[15].

Cumulative Effects

The cumulative adverse effects of weeds on all resources considered in this chapter are expected to decrease in the long-term due to the alternative's ability to: treat new infestations quickly (as a result of EDRR and an approved weed management plan); control known weed populations; and protect non-infested areas.

Two Resource Advisory Committee (RAC) projects proposed in the project area specifically address weed concerns. One project involves developing weed management plans for non-federal lands in and around Kake and the Petersburg and Wrangell boroughs. The project is ongoing and has been contracted to the Alaska Association of Conservation Districts. The second project proposes weed control (specifically reed canarygrass) in the Stikine-LeConte Wilderness area. Both of these projects, in conjunction with the implementation of Alternative 3, have the potential to provide more extensive weed management within the project area.

The past, present and reasonably foreseeable projects evaluated for this analysis have been consolidated into a Catalog of Events, located in the project record.

3.2.4 Design Features and Mitigation Measures

The project design features (PDFs) listed in Section 2.5.2 apply to non-native plant species. These criteria would be implemented as necessary according to the annual weed treatment plan (Appendix B).

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[15] See Krosse 2013a, Cost Analysis resource report; located in the project record.

3.2.5 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The alternatives in this environmental assessment comply with the Forest Plan and all relevant laws, regulations, and policies.

Forest Service Manual 2900 (USDA Forest Service 2011) and Tongass National Forest Handbook 2080 (USDA Forest Service 2007) provide the direction to Tongass National Forest resource managers for compliance and accountability for implementing the intent of the invasive species program. This project meets this goal on all levels of weed prevention, early detection and rapid response, control (treatment) and restoration.

3.3 Sensitive and Rare Plants

3.3.1 Introduction

The effect of proposed herbicide use on non-target plants, specifically sensitive and other special status species and cultural/traditional use plants was identified as an internal and public issue.

This section and Table 17 provide a summary of the effects analysis of the proposed actions in relation to threatened, endangered, sensitive and rare plants. A complete report is located in the project record.

3.3.2 Affected Environment

Rare and sensitive plants occur within the project area. For this project, a plant is considered rare if it is S1 or S2 on the Alaska Natural Heritage Program (ANHP) Rare Vascular Plant Tracking List[16]. Sensitive plants are also rare and are those plants designated by the Regional Forester for which population or habitat viability has, or is predicted to have, a downward trend (FSM 2670.5). The Forest Service-designated sensitive plants are also on the ANHP rare plant list and have a State rank.

Existing Condition

The rare and sensitive plant habitats present in the project area are very diverse, from beach forest to alpine. Terrestrial habitats are characterized by the abundance and movement of water. Well-drained site conditions support productive forest[17] habitats while poorly drained site conditions support wetlands and unproductive forests[18] (Schoen and Dovichin 2007, USDA Forest Service 2008c). Surface and subsurface water within the terrestrial habitats is influenced by geomorphology, geology, soil drainage, hydrology and climate (USDA Forest Service 2001b).

No federally listed threatened or endangered plants are known or suspected to occur on the Tongass National Forest. Therefore, effects on federally listed plants are not discussed.

Rare and sensitive plant surveys conducted for different management projects tend to, but not always, document the weed populations on the ranger districts. Therefore locations of known rare and sensitive plants also contain information of existing weeds, if present. However, most weed

[16] http://aknhp.uaa.alaska.edu/botany/rare-plants-species-lists/rare-vascular-hulten/#content
[17] Productive forests are also knows as "Productive Old Growth" and are defined as old growth forests capable of producing at least 20 cubic feet of wood fiber per acre per year, or having greater than 8,000 board feet per acre.
[18] Unproductive forests are defines as having less fiber or board feet per acre than productive forests.

populations in the project area are not close to known rare and sensitive plant populations. The closest known rare or sensitive plant to a weed population in the project area is approximately 600 feet.

3.3.3 Summary of Environmental Effects

Although Alternative 1 does not preclude future weed treatments within the project area, treatments would be limited to manual and mechanical. Treatments would require individual NEPA analyses which would slow response time, adversely affecting native plant communities. Also, without the ability to quickly respond to new infestations using early detection-rapid response as a management tool, weeds could continue to spread and indirectly affect non-target rare plants due to untreated aggressive weeds. For Forest Service sensitive plant species, the No-Action Alternative "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability for seven sensitive plants". There are fewer beneficial effects from this alternative than from the action alternatives.

Alternative 2 complies with Forest Plan recommendations for weed treatment and includes EDRR. There are no direct or cumulative effects on non-target sensitive and rare plants for this alternative. The Proposed Action has the most beneficial effects to non-target sensitive and rare plants and their habitat.

Alternative 3 does not comply fully with Forest Plan recommendations for conducting weed treatments because it does not have herbicides as a management tool. There would be no direct effects to non-target sensitive and rare plants, but the potential exists for indirect effects due to not controlling aggressive weeds in the project area with the full suite of management tools available. Therefore, there are potential cumulative effects to non-target plants and their habitats. This alternative has limited beneficial effects to non-target rare plants and their habitats.

Table 17. Summary of effects to non-target rare plants which includes rare and sensitive plant species on the Petersburg and Wrangell Ranger Districts

	Effects			
Alternative	**Direct**	**Indirect**	**Cumulative**	**Beneficial**
1 – No Action	No	Potential	May Impact	None
2 – Proposed Action	No	No	No	Yes
3 – Integrated weed management without herbicide	No	Potential	Potential	Limited

3.3.4 Design Features and Mitigation Measures

Project design features (see Section 2.5.2) would be applied during implementation to minimize or eliminate the potential for weed treatments to adversely affect non-target plants such as sensitive and rare plants.

3.3.5 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Forest-wide Standards and Guidelines (S&Gs) for Invasive Species (USDA Forest Service 2008b, p. 4-22) involve prevention, early detection-rapid response (EDRR), control and management, and rehabilitation and restoration as management tools. Alternatives 1 and 3 would minimally follow the S&Gs for invasive plants; however, the EDRR management tool would not

be in place if Alternative 1 is selected. Alternatives 1 and 3 would be limited to manual and mechanical treatments which can be more costly and labor intensive and in some cases, less effective at controlling weeds. Alternative 2 would comply with the S&G for invasive plants; it calls for EDRR if highly invasive plants occur in the project area, along with control and management of species and restoration.

The Standard and Guidelines for rare and sensitive plants in the Forest Plan (USDA Forest Service 2008b, p. 4-41) would be followed in Alternative 2 by providing a buffer between known sensitive plants of at least 60 feet for any herbicide applications. This project proposes a conservative 100-foot buffer for all known rare and sensitive plant species.

3.4 Soils and Wetlands

3.4.1 Introduction

The National Forest Management Act requires that lands be managed to ensure the maintenance of long-term productivity, soil hydrologic function, and ecosystem health. The Forest Plan has a goal to maintain soil productivity and minimize soil erosion and to maintain and restore the biological, physical, and chemical integrity of waters on the Forest, and a specific guideline to avoid adverse impacts to soil and water resources (USDA Forest Service 2008b, p. 4-65).

A public concern about herbicides accumulating in soils and harming soil biota was raised during scoping.

3.4.2 Affected Environment

Existing Condition

A wide variety of soil types occur in the project area. They are relatively young (with respect to geologic time) and developed in a cool, moist, high-precipitation maritime climate. Due to area's geologically youthful soils, clay development is minimal with most soils containing a very minor component of clay particles. This is important to note since it is both clay and organic matter responsible for the adsorption and subsequent binding of chemicals to the soils due to their inherent cation exchange capacity (CEC)[19]. Clay content and soil organic matter are discussed more fully in this section as it relates to soil adsorption of chemicals as well as the role they play in overall soil drainage and soil organisms which are responsible for the breakdown of nutrients and other soil chemicals.

Soils in the project area range from moderately deep well-drained mineral soils that support productive forests to very poorly-drained organic soils that support wetland plant communities.

Most mineral soils in the project area are covered with an organic mat or duff layer 4 to 8 inches thick. The buildup of organic material on the mineral surfaces is a result of the climate in Southeast Alaska. Cool atmospheric temperatures coupled with cool soil temperatures inhibit microbial decomposition at the ground surface; thus, organic layers build up on the mineral surface. The high precipitation and cool temperatures result in the accumulation of organic material in surface horizons. The clay content in mineral soils ranges from about 0 to 12 percent, with a few soils containing a maximum of about 20 percent clay. CECs for mineral soils range

[19] Cation exchange capacity is the sum total of exchangeable cations that a soil can adsorb. Expressed in milliequivalents (meq) per 100 grams of soil.

from 10-50 meq/100 grams, which is generally low compared to soils having higher clay content. As a rule, soils with large amounts of clay and organic matter will have higher exchange capacities than sandy soils low in organic matter.

Soil drainage of mineral soils is dependent on the slope gradient and the underlying materials which may limit water percolation (e.g., bedrock or glacial till deposits). Therefore, mineral soils range in their ability to percolate water through the soil (leaching): well-drained soils having a high percolation rate, to poorly-drained soils having low percolation rates. The thick organic duff layers, coupled with overall low clay content, make mineral soils highly permeable; therefore, overland flow of excess water, as a result of rain or flooding, is uncommon. As well, mineral soil erosion due to exposure to rain and subsequent sedimentation is also not common when the mineral soils are left undisturbed. Once mineral soils are disturbed and the organic duff layers are removed, soil erosion and subsequent sedimentation becomes more of an issue, such as the case in many of the site types described in Section 2.4.3.

Thicker accumulations of organic layers yield organic soils which are commonly formed in areas with poor drainage. Most organic soils are also classified as wetlands, with the exception of one well-drained organic soil found in forest habitats. Organic soils vary in their degree of decomposition which is highly dependent on the soil temperature and water content of the site. As mentioned above, soil organic matter is also responsible for adsorption of chemicals. Depending on the degree of decomposition, organic soils' CECs range from 25-50 meq/100 grams in fairly undecomposed peat, to about 75-90 meq/100 grams in moderately-high to highly- decomposed mucky peats and mucks. Relatively speaking, the more decomposed the organic material, the higher the CEC. The higher the CEC, the better able the soil is to adsorb nutrient and other chemicals.

In Southeast Alaska, site productivity is primarily a function of soil drainage and soil depth (USDA Forest Service 1993). Soil drainage classes refer to the frequency and duration of periods of saturation or partial saturation which are categorized into four classes, from well-drained to very poorly-drained. Well-drained soils tend to support highly productive forest stands while poorly-drained soils support marginally productive forests and typically meet the criteria of a wetland. Other poorly drained sites include shrub and herbaceous wetlands and alpine areas, all of which are dominated by non-forest plant communities.

Of utmost importance in evaluating site productivity and nutrient cycling are the soil organisms that decompose organic carbon and other chemicals. Very little is known regarding the species and composition of soil biota of in this project area; however, the general trends in soil drainage and temperature regimes have specific ramifications in regard to presence and functioning of aerobic soil organisms. In general, with lower temperature and higher moisture content, soil biota has limited function. Therefore, chemical breakdown is limited as is overall decomposition. The more saturated the soil (as in the case of wetlands), the more limited the soil biota. This is relevant to this project since the natural condition of the cool and moist environment sets the stage at very limited levels of decomposition under natural conditions. With the presence of chemicals that may affect the natural functioning of soil organisms, this may be exacerbated and should be evaluated to assess the effects of herbicide use on site productivity. Also, with possible decreased level of soil organism function, the degradation of chemicals in the environment is affected.

Therefore, the evaluation of soil texture (percent organic matter and clay content), presence of soil organisms, and overall percolation or leaching of the soils all contribute to understanding the possible effects of herbicides in the environment. Further, these factors also contribute to possible

affects to soil productivity as a result of soil disturbance due to mechanical and manual weed treatments.

Soil Erosion

Soil erosion is a naturally occurring phenomenon and in Southeast Alaska is most commonly associated with mass movement events, such as landslides. Dense vegetative cover and organic duff layers on the forest floor protects much of the native soils from surface erosion, thus when the vegetation and soil duff layers are removed, erosion can occur. The amount of erosion depends on the erodibility of the soil (a function of soil texture), the amount and intensity of rainfall, slope length and slope steepness. Maintaining vegetative cover and a duffer layer is the primary means of preventing soil erosion and sedimentation.

Of the site types evaluated in this project, several are considered disturbed soils, meaning they have little or no organic duff layers, are generally compacted and often comprised of gravelly or coarse-textured soils with little or no organic carbon or clay. These include roadsides, administrative sites, campgrounds, cabins, trails, marine access facilities and rock pits. Therefore, the soils in these site types have limited ability to adsorb chemicals. In addition, the compact nature of these sites types and the lack of organic duff layers yield low percolation rates and may be sites at risk to surficial erosion.

Soil Productivity

Region 10 Soil Quality Standards state a minimum of 85 percent of an area should be left in a condition of acceptable productivity potential for trees and other managed vegetation following land-management activities. Detrimental soil conditions, as defined in Forest Service Manual 2554, are areas of soil that have been altered to the point where soil productivity has been affected. Detrimental soil conditions are typically associated with road construction, log felling, and log yarding; however, soil productivity could also be affected by loss of soil organisms that contribute to productivity.

Soils and Site Types

A brief summary of the general soil characteristics for each site type is provided in Table 18 to establish a link between the concepts mentioned above regarding soil adsorption of chemicals, leachability, effects on soil organisms and site productivity, and soil erosion.

Table 18. Soil characteristics for each site type

Site type	Soil texture	Drainage	Organic material content	Clay content	Percolation	Runoff potential
Roadside	Disturbed, coarse-textured	Well-drained	Low, except along wetlands	Low	Moderate to low due to compact soils	High, except along ditches
Administrative sites, campgrounds, cabins	Disturbed, coarse to loamy	Well- to moderately well-drained	Low, except along wetlands	Low	Moderate to low due to compact soils	High
Wetlands	Peaty to mucky; some silty, if mineral	Somewhat poorly- to poorly-drained	High	Low	Moderate to low due to saturated condition of soils	Low, except during period of heavy rainfall

Site type	Soil texture	Drainage	Organic material content	Clay content	Percolation	Runoff potential
Trails (including trailheads)	Disturbed, coarse-textured; soils may be fine-textured or organic if not hardened by gravel	Well- to poorly-drained	Low to high (site dependent)	Low	Moderate to low due to compacted soils (except in wetlands)	High, except along ditches and/or stream crossings
Forest	Course to medium (loams, silt loams) and/or peats and mucky peats	Well- to somewhat poorly-drained (forested wetlands can be poorly-drained)	Moderate to high	Low	Moderate to high	Low if organic duff layer intact
Marine access facilities and rock pits	Disturbed, coarse-textured (gravels, sands, loams and silt loams)	Well- and poorly-drained if soils are removed from rock bodies	Low	Low	Moderate to low due to compacted soils and bedrock exposed	High
Streams and floodplains	Course to medium (gravels, sands, loams and silt loams)	Well- to somewhat poorly-drained (palustrine streams in wetlands can be poorly-drained)	Moderate to low	Low	High	Low if organic duff layer intact due to coarse-textured soils
Stream crossings	Course to medium (gravels); possibly some peats and mucks	Well- to somewhat well-drained (forested wetlands can be poorly-drained)	Low	Low	Moderate to high	High in ditches and culverts
Estuaries	Medium textured (loams, silt loams, silts) and/or peats and mucky peats	Well- to somewhat poorly-drained (mucky peats and mucks can be poorly-drained)	Moderate to high	Low	Moderate to high	Low if organic duff layer intact

Wetlands (Including Estuaries)

Wetlands are defined as "those areas that are inundated or saturated by surface water or groundwater with a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions." (40 CFR 230.41(a)(1). Wetlands make up a large percentage of the project area (approximately 29 percent). There are 387 acres within the wetland and estuary site types in the project area infested

with target weeds species (280 acres in wetlands and 107 in estuaries); which is approximately 0.04 percent of the wetlands in the project area (see Table 3 in Section 2.4.3).

Three criteria are used to determine whether a site is a wetland or not: vegetation, soils and the hydrology of the site. Most estuaries in Southeast Alaska are considered wetlands due to the combination of saturated soils and the dominance of hydrophytic vegetation. Estuarine wetlands consist of deep water and adjacent tidal habitats that are usually semi-enclosed by land and have open, partly obstructed or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The limits of the estuarine wetlands extend upstream and landward to where ocean-derived saltwater mixes to a significant level with freshwater. The estuarine system includes both estuaries and lagoons and is more strongly associated with land than is the marine wetland system (see below). In terms of wave action, estuaries are generally considered to be low-energy systems (Cowardin et al. 1979).

Within this project area, 96 percent of the wetland types are classified as Palustrine – freshwater wetlands, and water bodies. Lacustrine (lake) systems make up about 2 percent of the wetland area. The remaining 2 percent are primarily classified as Riverine – fresh, flowing water contained within a channel and estuarine along the shoreline (Table 19).

For this project analysis, the impact of weed treatment methods on wetlands is based on its potential as a vector for the spread of weeds; and the impact on water quality from herbicide use. The relative wetness of a site is evaluated somewhat equally in this analysis across wetland types. However, due to the biological significance of estuarine wetlands, wetlands are evaluated in two classes: 1) Estuarine wetlands (due to their extremely high habitat value for fish and wildlife) and 2) all other wetlands (which include Palustrine, Riverine and Lacustrine types).

Wetland Functions

Wetland functions are specific roles the wetlands play in a landscape in terms of retarding sediment, providing habitat and biodiversity. Functions are not static: they change in response to succession, climate, and human-induced changes. Wetland functions may be grouped into any number of categories. One wetland evaluation method developed for Alaska (Buell and Moody 1993) categorized functions based on three major categories: aquatic use support, terrestrial use support, and human use support. These categories are further subdivided into individual functions. However, a lack of fundamental scientific understanding of the functions of wetlands in Southeast Alaska implies that generalized indicators or predictors of wetland functions cannot be identified with confidence.

Biologically Significant Wetlands

Assessing the biological significance of wetlands in the project area, relative to wetlands both within and outside the project area, is important for two reasons: 1) to understand wetland impacts of the proposed action and 2) to make informed decisions on mitigation opportunities. According to the Code of Federal Regulations (33CFR 320.4(b)), wetlands considered to perform functions important to the public interest include:

- Wetlands which serve significant natural biological functions, including food chain production, general habitat and nesting, spawning, rearing and resting sites for aquatic and land species;
- Wetlands set aside for the study of the aquatic environment;

- Wetlands where alterations will trigger detrimental natural drainage characteristics such as sedimentation patterns, current patterns, etc.;
- Those that shield other areas from wave action, erosion, or storm damage;
- Those that serve as valuable storage areas for storm or flood waters;
- Those which are discharge areas that maintain minimum base flows to aquatic resources and those that are prime aquifer recharge areas;
- Those that purify water; and
- Wetlands unique in nature or scarce in quantity to the region or local area.

In general, the Estuarine and Riverine systems and the emergent Palustrine systems have the highest biological significance.

Scarcity

Wetland scarcity is another consideration when determining the relative value of wetlands. Scarcity can be determined based on the wetland's unique characteristics, and its aerial extent, both locally and regionally. To determine the latter, the wetland aerial extent, a calculation of total acres by wetland type is necessary. Scarcity was determined at the sub-watershed scale (treatment area). A Geographical Information System (GIS) analysis produced total acres by wetland type and percent of total project area, given in Table 18. While not all wetland classes below are used for analysis of this project, Table 18 presents total acres of wetlands by the 5 major classes, representing a relative look at scarcity.

Table 19. Wetland acres and the proportion of the project area

Wetland type	Wetland type size (acres)	Proportion of the project area
Palustrine	1,052,600	28%
Estuarine[1]	11,237	0.3%
Lacustrine	23,524	0.6%
Marine[1]	160	0.004%
Riverine	12,159	0.3%
Total	**1,099,680**	**29.2%**

[1]Does not include sub-tidal lands.

Palustrine wetland types are abundant in the project area and are typically the wetlands that would be affected by weed treatment activities during the life of this project. Currently there are 173 acres of known target weed infestations within the riverine wetland type.

Herbicide Characteristics and their Behavior in Soils

Herbicides vary in terms of their chemical and biological behavior in the environment. Additional determinants of herbicide behavior include soil texture, organic matter content, soil pH, time, temperature, topographic position, and moisture. Properties that influence the behavior of herbicides in the environment are summarized below. This summary is based on information provided by Miller and Westra (1998) in Colorado State University Fact Sheet Herbicide Behavior in Soils.

- Acid or base strength - refers to whether an herbicide has basic, acidic, or nonionic properties. This factor determines the ability of an herbicide to exist in soil water or be retained onto soil solids. In general, herbicides whose pH is close to the pH of soil are strongly retained and are not subject to runoff, erosion, and/or leaching. In contrast, herbicides whose pH is not close to that of the soil are less strongly retained and are subject to runoff, erosion, and/or leaching. These herbicides are also more available for plant uptake than those herbicides that are strongly retained onto soil solids.

- Water solubility - refers to how readily an herbicide dissolves in water and determines the extent to which an herbicide is in the solution (water) phase or the solid phase. An herbicide that is water soluble generally is not retained by soil.

- Volatility - refers to the tendency of an herbicide molecule to become a vapor. Herbicides with high vapor pressures are likely to escape from the soil and volatilize in the atmosphere.

- Soil retention - is an index of the binding capacity of the herbicide molecule to soil organic matter and clay. In general, herbicides with high soil retention are strongly bound to soil and are not subject to leaching. Those not exhibiting high soil retention are not strongly bound and are subject to leaching, as is the case for soils with low clay and organic matter content.

- Soil persistence - refers to how long it takes the herbicide to dissipate; it is typically expressed in terms of a half-life, as determined under normal conditions in the region where the herbicide would be used. The half-life can vary significantly depending on soil characteristics (organic matter, clay content and soil organisms), weather (temperature and soil moisture) and the vegetation at the site.

Probably the most important factor determining the fate of herbicide in the environment is its solubility in water (Tu et al. 2001). For information regarding herbicide characteristics in water, refer to the Hydrology and Aquatic Organisms section of this EA.

Herbicides Proposed for Use

The effect of a chemical treatment on the soil depends on the particular characteristics of the chemical used, how it is applied, and the soil's physical, chemical and biological condition (Table 20). This section provides an overview of the chemicals proposed for use. The effects of their use, as related to this project, are discussed in the Environmental Effects section.

Glyphosate

Glyphosate has high solubility in water and low volatility. Because it readily reacts with clay and metal oxides in soils to form insoluble iron, aluminum and calcium precipitates, it has very high soil retention and low potential for leaching. Plants typically do not absorb glyphosate from soil due to the high retention. Persistence in the soil is short due to the formation of insoluble precipitates, making them biologically inactive upon contact with mineral soils. Studies have found that the half-life of glyphosate ranges from 3-149 days depending upon soil microorganisms (Schuette 1998). A half-life is defined as the time it takes for 50 percent of the chemical to degrade to other compounds.

Aminopyralid

Aminopyralid is a pyridine carboxylic acid herbicide intended for use in natural areas. It provides systemic post-emergence broad-spectrum control of a number of weeds as well as provides residual weed control activity reducing the need for retreatment. Aminopyralid has a moderate-to-low solubility in water and is essentially non-volatile. Half-lives ranged from 32 to 533 days with a typical half-life of 103 days. It has a moderate persistence in the soil, and a moderate potential to leach through soils and contaminate groundwater (US Environmental Protection Agency 2005).

The predominant means of aminopyralid degradation in the environment is likely aerobic soil metabolism. The resulting products are two metabolites, oxamic and malonamic acid and the formation of CO_2 (US Environmental Protection Agency 2005).

Imazapyr

Imazapyr is a non-selective herbicide; its mode of action is as an acetolactate synthesis inhibitor. Imazapyr does not bio-accumulate or bio-concentrate (build up); it photo-degrades in water with a half-life in water of 1-2 days, and is degraded by soil microbes with a half-life in soil of 25-180 days. Imazapyr is weakly bound to soil. High organic matter and low pH increase the adsorption to moderate levels, making it moderately mobile in soil. It can be exuded into soil from roots of treated plants; plants can absorb imazapry from soil because it is not tightly bound like glyphosate. Similar to aminopyralid, it is active in soil as a pre-emergent (i.e., the herbicide prevents seed germination). Label restrictions allow for use in intermittent drainages, flood plains and bogs when no water is present.

Table 20. Herbicide characteristics in soil

Herbicide	Solubility in water (ppm)	Mobility in soil	Half life in soil
Glyphosate	1,570 High	Low mobility	3-149 days Moderately persistent
Aminopyralid	2,480 High	High mobility	32-533 days Moderately persistent
Imazapyr	High	Very high mobility	25-180 days Moderately persistent

Source: Pacific Northwest Weed Management Handbook: http://pnwhandbooks.org/weed/

3.4.3 Environmental Effects

Effects displayed in this analysis specific to herbicide characteristics and pathways are primarily derived from herbicide risk assessments (SERA 2003, 2004, 2007b, 2011a and 2011b) with specific references to the characteristics of Southeast Alaska soils. These assessments contain pertinent information, when available, on the potential effects of herbicide applications on the soil resource, including effects to soil organisms, models of individual herbicide movement, and specific information about herbicide properties such as persistence, adsorption rates to mineral soil or organic matter, and solubility in water.

Indicators used to assess effects include:

- physical disturbance which could lead to soil erosion, loss of soil permeability and reduced productivity;

- chemical impacts to soil biota which could lead to reduced soil productivity and chemical breakdown and may influence the half-life projections of herbicides in the environment; and
- a qualitative assessment of herbicide treatments based on the particular characteristics of the chemical used, how it is applied, and the soil's physical, chemical, and biological condition.

Direct, Indirect and Cumulative Effects by Alternative

Early detection-rapid response is part of both action alternatives, and is considered in this effects analysis.

Alternative 1 – No Action

Direct and Indirect Effects

Under this alternative, existing small-scale hand-pulling and tarping treatments would continue. Hand-pulling weeds, as well as other mechanical methods, may impact soil productivity by creating disturbance in the form of mixing, churning, digging and trampling from workers who treat the weed populations. This disturbance may lead to erosion if the site's organic layers are removed or compacted, leading to a loss in soil percolation. Tarping, or solorization, may impact soils by producing enough heat over a period of time to effectively reduce the microbial population of the soil, thus impacting long-term soil productivity. If not immediately revegetated, removal of weeds in highly disturbed soils could lead to increased soil erosion and maintain oreven enhance the site's vulnerability to new weed infestations.

Cumulative Effects

Only those sites currently being treated would be treated; additional acres would not be added. As such, the treatment acres would likely decrease through time. Since treatment operations have been minor, including the use of very few personnel over large areas, the impacts of workers on the soils are negligible and have no effect on soil organic matter content. Minor amounts of soil disturbance may occur but would not exceed the soil quality standards outlined above and no detrimental effects would occur. As populations decrease with time, the use of tarping as a method of treatment would also decrease; therefore, any adverse effects to localized soil microbial populations would be minimal over the project area.

Absence of additional weed treatments in the project area may cause impacts to other resources (e.g., vegetation community changes and habitat alteration); however, the impacts to the underlying soils would likely be negligible unless unforeseen chemical impacts to soils derived from weedy plants (e.g., the possibility of allelopathic[20] associations with any of the weed species) cause short-term negative effects to soils and associated physical and biological components and processes. In such a case, impacts to soils could increase over the long-term due to the continued growth of current infestations and the establishment of new populations.

[20] Allelopathy is defined as the inhibitory or stimulatory effects of released organic chemicals by one plant on the germination, growth, or metabolism of a different plant (Helms 1998).

Alternative 2 – Proposed Action

Direct and Indirect Effects

The effects to soils and wetlands specific to the use of herbicides are addressed here. Impacts from non-herbicide activities are addressed in the next section (Alternative 3).

Soil conditions affect how an herbicide will move through a terrestrial system and its eventual fate in the environment. The proposed herbicide treatments may affect soil productivity as it affects nutrient cycling, which is a function of the soil biota necessary for decomposition and nutrient availability. Soil biota also affect the longevity (or half-life) or chemicals in the environment. Herbicides can accumulate in soils and may harm soil biota, which perform nutrient cycling functions necessary for decomposition and soil productivity. The three herbicides proposed for this project (aminopyralid, glyphosate, imazapyr) do not persist in soil for long periods of time (see Tables 20 and 21).

Herbicide characteristics that affect their behavior and persistence in the environment include solubility in water, degradation rates in soils and water, leachability, and adsorption to soils. Table 21 shows the proposed herbicides and pertinent physical and chemical characteristics (SERA 2003, b; 2004; 2007b; 2011a, b).

Table 21. Herbicide behavior in the environment

Chemical name	Fate in the environment	Hazards	Leaching potential	Solution runoff potential	Absorbed runoff potential
Aminopyralid	Highly soluble in water and mobile in soils. Degrades rapidly in water. Relatively stable in soils. Unknown if toxic to soil microorganisms.	New herbicide, limited toxicity information available. Can leave residues in soil. May leach to groundwater.	High	Low	Low
Glyphosate	Adsorbs tightly to soils. Subject to rapid microbial degradation. Non-toxic to soil microorganisms. Low drift potential.	Should not be used prior to predicted rainfall. May require re-treatment.	Very low	Low	High
Imazapyr	Highly mobile in sandy soils. Potential for offsite movement through drift, runoff, or wind erosion. Degrades rapidly in water and slowly in soils. Relatively non-toxic to soil microorganisms.	Can leave residues in soil. May leach to groundwater.	High	High	Intermediate

Overuse, or careless use, of herbicides can produce short- to long-term soil and groundwater quality impacts, as well as short-term impacts to surface water quality. Risk assessments indicate

some herbicides can affect the biological community in soils, potentially reducing its productivity (SERA 2003a, b; 2004; 2007b; 2011a, b). Herbicides applied with backpack sprayers can be transported by even low velocity winds to non-target soils and streams. Design features (see Section 2.5 for a complete list) have been built into the Proposed Action to reduce the potential impacts from herbicides to a negligible level.

Herbicides are typically used with adjuvants, compounds which enhance the capability of the herbicide to stick and spread over vegetation and to penetrate into plant tissues. The amount of any adjuvant used would make up a small percentage of the herbicide mixture, keeping the effects on the environment, including soils, within the same range as the herbicide being used (Bakke 2007).

Although herbicide would be applied directly to weeds, it may be inadvertently applied to the soil surface between plants. Some of the herbicide applied to plant and soil surfaces would leach into the soil subsurface, particularly water soluble compounds such as aminopyralid. Because some species of soil microbes metabolize aminopyralid, these species could temporarily increase where aminopyralid leached into soil (SERA 2007b). Rate of degradation is related to rate of microbial activity which is heavily influenced by (soil and air) temperature. Aminopyralid is considered moderately persistent in soil with a half-life average of 40 days.

Results of bioassays conducted in compliance with herbicide registration concluded that soil microorganisms and earthworms were not adversely affected when subjected to labeled application rates. Potential for offsite loss was characterized as a negligible risk where aminopyralid use was restricted to labeled application rates and stipulations (SERA 2007b).

In contrast to aminopyralid, glyphosate has a different action and effect in soils (SERA 2003a, SERA 2011b). Glyphosate degrades via microbial action in upland soils and via microbial action and photolysis in aquatic environments. Glyphosate either has no effect or tends to increase soil microbes or microbe activity. None of the study results indicated long-lasting or deleterious effects on soil ecology. Because this compound readily binds with soil organic matter (such as the case of wetlands), high organic matter content in soil will reduce the probability of the chemical moving offsite via water percolation through soils.

Potential for offsite transport and dispersal of glyphosate is also influenced by post-application rainfall. Offsite movement may occur where moderate to heavy rain occurs in the weeks immediately following application. Despite such a possibility, there is no indication that limited offsite movement would adversely affect non-target plants following ground-based low volume applications. In sum, such applications would negligibly and temporarily affect soil ecology following application.

Soils

Effects to soil resources would be negligible and short-term. The best methods to control potential adverse effects from herbicide treatment are the use of PDFs and following directions on manufacturer labels. Direct hand application also minimizes the amount of herbicide needed to treat weeds. Design features to reduce impacts to soil include developing an herbicide transportation, handling, and emergency spill response plan, having a spill kit on site when herbicide treatment methods occur, and limiting the amount of herbicide used to the minimum amount required to be effective. Soil type would also be determined prior to treatment and treatments planned accordingly. This pre-treatment site evaluation would include describing the overall soil organic matter and clay content, soil moisture levels and pH levels, as well as

describing any underground water deposits that may be subject to effects of chemicals leaching from above. With this information, a site-specific evaluation of impacts to soil organisms and thus, site productivity would be made. With these measures in place, the risk to impacting soil productivity by impacting soil organisms responsible for nutrient cycling is low.

Additionally, use of aminopyralid and imazapyr in well-drained soils with high percolation rates should also be evaluated during the annual site prescriptions since these chemicals have a high leaching potential. It may be prudent to choose glyphosate as the preferred herbicide in well-drained soil conditions (coarse textured soils that lack clay and organic matter) if there are any concerns of impacting underground water. However, bedrock and glacial till deposits are typically not deeply deposited in Southeast Alaska; therefore, the development of water tables or other such aquifers is a rarity.

Wetlands

Design features combined with label instructions for use of herbicides in wet environments would help avoid adverse impacts of chemicals to the values and functions of wetlands, including those with biological significance. Additional mitigation opportunities, such as reseeding and other site restoration practices, should be used to compensate for any disturbances in all wetlands. Since wetland soils typically have very high organic matter content, even with the overall rating of high leaching potential for aminopyralid and imazapyr, adsorption of chemicals would be high due to the relatively high cation exchange capacities of these soils. As a consequence, leaching potential may be lower than anticipated.

Since wetland soils are typically saturated and cold, the biological content is already limited and would be dominated by anaerobic decomposers, which by definition decompose organic matter and other chemicals at a slower rate. With the limited biological community in these site types, effects to soil organisms are an important consideration. Since herbicide risk assessments indicate non-toxicity to soil microorganisms for glyphosate and imazapyr, there are no detrimental effects to soil microorganism populations using these herbicides. To address the lack of information on the fate of soil microorganisms with use of aminopyralid.

Early Detection-Rapid Response (EDRR)

Herbicide treatments using EDRR would not exceed the minimal effect predicted for soils under the most ambitious treatment scenario (200 acres per year for 10 years) and would be sufficiently minimized by the PDFs regardless of when the treatments occurred. If effective treatments of new infestations required herbicide treatments outside the scope of the project, or if PDFs could not be applied without a significant loss of effectiveness, further analysis would be required.

Cumulative Effects

Cumulative effects can occur from natural events, development activities and general human use in the project area. The proposed use of herbicides combined with past, present, and reasonably foreseeable actions is not likely to result in adverse impacts on the soil and wetland resources in the project area. Past activities include road building and maintenance, timber harvest, outfitter and guide use, and construction and maintenance of developed recreation facilities. Past and foreseeable actions would be reviewed prior to implementation and with future actions designed to protect soil and wetland resources. The level of herbicide use on non-NFS lands is unknown; however, incidental use is likely the case within the major communities of the project area. Since most weeds within communities occur in developed sites and home gardens, the cumulative effects to soils across the entire 3.6 million acre project areas would be insignificant.

According to the analysis presented in Section 3.2.3, the anticipated need for herbicides for treating the 441 acres of known weed infestations would be over a period of 6 years, with the most acres being treated in years 1, 2 and 3. By year 6, only 2 acres of treatment using herbicides are anticipated. This does not account of the potential EDRR acres that could be added in the future. Whether additional EDRR acres are treated or not, the total herbicide usage is anticipated to be very low over the life of this project.

Alternative 3 – Integrated Weed Management without Herbicide

Direct and Indirect Effects

Hand pulling and mechanical treatments may expose bare soil. Exposing bare soil may result in increased soil erosion, and depending on how treatments are conducted, the soil could be compacted or displaced. Hand pulling, pulling using tools, clipping and cutting, tarping and torching have similar impacts including ground disturbance due to foot traffic, dislodging sediments into streams, and the creation of foot trails, bare areas and disturbed ground. Hand treatments typically require multiple entries, possibly several per year, increasing the potential for these effects. Hand pulling and pulling using tools, would result in the greatest amount of soil disturbance compared to clipping and cutting, tarping, or torching.

Tarping may reduce the number of soil microorganisms near the ground surface due to the heat generated by the tarp. This effect would be confined to the upper 1 or 2 inches of soil because soil is a poor conductor of heat. The heated zone should re-colonize with microorganisms quickly from surrounding unaffected populations. Therefore, it is unlikely the minor amount of thermal impacts to soil organisms in the limited area produced by tarping would have any substantial affects to long-term site productivity.

Areas of trampled or disturbed bare ground erode more readily than vegetated areas. Since most weed species are relatively thin and scattered, it is anticipated that disturbed areas would be small and scattered, keeping the overall adverse impacts to soils negligible to minor. The amount of soil disturbance generated by hand crews is negligible, very localized and short-term.

Overall, adverse impacts from non-herbicide treatment activities would be negligible to minor and short-term.

Cumulative effects

Although no herbicides are proposed with this alternative, the cumulative impacts to soils and wetlands would be similar to Alternative 2: negligible, localized and short-term with long-term beneficial effects. The cumulative effects for Alternative 3 would not cumulatively increase adverse effects to any extent.

Any current and foreseeable actions would be reviewed prior to implementation and designed to protect soil and wetland resources.

3.4.4 Design Features and Mitigation Measures

Project design features were developed to minimize the potential for adverse effects on soil during the implementation of this project. Herbicide treatments would be applied in accordance with label advisories, USDA Forest Service policies, Forest Plan management direction, human health and ecological risk assessments.

Project implementation, following the design features developed to protect soils and wetlands (see Section 2.5.2), is anticipated to have minimal effects due to the limited extent of the activities and the constraints built into the project, including the new National Best Management Practices for Water Quality Management on National Forest System Lands[21].

3.5 Hydrology

3.5.1 Introduction

The effect of weed treatments on project area waters was identified as an internal and public issue.

Federal and state laws, policies and regulations control the use of herbicides on National Forest System lands, including the Clean Water Act and the Federal Water Pollution Control Act. Section 208 of the 1972 amendments to the Federal Water Pollution Control Act (Public Law 92-500) specifically mandated identification and control of non-point source pollution. Clean Water Act Section 303(d)(2) requires states submit, and EPA approve or disapprove, lists of waters for which existing technology-based pollution controls are not stringent enough to attain or maintain state water quality standards and for which total maximum daily loads (TMDLs) must be prepared. Currently, no impaired waterbodies occur within project area boundaries.

The Forest Plan (USDA Forest Service 2008b) provides direction to protect and manage water resources. Forest Plan Standards and Guidelines for water resources relevant to this project include but are not limited to the following direction:

- "Maintain water quality and quantity to protect the state-designated beneficial uses";
- "Apply Best Management Practices (BMPs) to all land-disturbing activities as a process to protect the beneficial uses of water from nonpoint sources of pollution";
- "Seek to avoid adverse impacts to soil and water resources (such as accelerated surface erosion or siltation of fish habitat) when conducting land use activities on wetlands, flood plains, and riparian areas";
- "Maintain water quality consistent with Alaska Water Quality Standards (18 AAC 70) and protect source watersheds consistent with the federal Safe Drinking Water Act and the Alaska Drinking Water Regulations (18 AAC 80)".

Forest Plan management objectives for riparian areas include but are not limited to the following direction:

- "Maintain riparian areas in mostly natural conditions for fish, other aquatic life, old-growth and riparian-associated plant and wildlife species, water-related recreation, and to provide for ecosystem processes, including important aquatic and land interactions";
- "Protect water quality by providing for the beneficial uses of riparian areas".

The National Best Management Practices for Water Quality Management on National Forest Lands provides direction for chemical use management activities, including the application of herbicides (USDA Forest Service 2012). The stated objective for BMPs related to chemical use

[21] http://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf

near waterbodies is to "Avoid or minimize the risk of chemical delivery to surface water or groundwater when treating areas near waterbodies" (BMP Chem-3). Further direction includes but is not limited to the following:

- "To help protect surface waters and wetlands from contamination, a buffer zone of land and vegetation adjacent to the waterbody may need to be designated";
- "Determine the width of a buffer zone, if needed, based on a review of the project area, characteristics of the chemical to be used, and application method";
- "Prescribe chemicals and application methods in the buffer zone suitable to achieve project objectives while minimizing risk to water quality"; and
- "Avoid, minimize, or mitigate unintended adverse effects to water quality from chemical treatments applied directly to waterbodies" (BMP Chem-4).

Invasive and non-native plant (hereafter "weeds") management activities are designed to enable compliance with State requirements in accordance with the Clean Water Act for the protection of waters of the state of Alaska, and are subject to the Forest-wide Standards and Guidelines related to water quality and riparian management areas (RMAs). Best management practices (BMPs) would be applied in planning, implementing and maintaining weed management activities.

3.5.2 Affected Environment

Existing Condition

Watersheds

Two hundred twenty-three 6th level HUC watersheds occur within the project area. Fifty-nine of these watersheds have known populations of weeds. One percent or less of the area in any of these 57 watersheds contains weeds, and most (42) contain less than 20 acres of weed populations (Table 22). Within this analysis, 200 acres is the maximum annual number of potential treatment acres.

Table 22. Summary of 6th HUC watersheds within the project area with known populations of weeds.

Watershed name	Watershed acres	Infested acres	% Watershed infested
North Arm Duncan Canal-Frontal Duncan Canal	30,731	104.5	0.3
Sunrise Lake-Frontal Sumner Strait	5,954	61.6	1.04
Towers Arm-Frontal Duncan Canal	21,791	0.1	0.0
190102090201-Helen Peak	7,198	31.9	0.44
Portage Bay-Frontal Frederick Sound	6,058	18.5	0.31
Blind River	12,100	26.9	0.22
Anita Bay-Frontal Zimovia Strait	17,313	38.4	0.22
Wrangell Island-Frontal Eastern Passage	18,122	36.1	0.20
Mitkof Island-Frontal Frederick Sound	19,727	39.2	0.20
Woodpecker Cove-Frontal Sumner Strait	12,515	23.7	0.19
Ohmer Creek-Frontal Blind Slough	13,152	24.6	0.19
Colorado Creek-Frontal Wrangell Narrows	48,264	78.6	0.16

Watershed name	Watershed acres	Infested acres	% Watershed infested
190102090301	15,946	21.2	0.13
Rowan Bay-Frontal Chatham Strait	4,767	5.0	0.11
Big John Bay-Frontal Rocky Pass	15,786	15.5	0.10
Keku Strait-Frontal Frederick Sound	25,195	24.7	0.10
Salamander Creek	11,461	9.9	0.09
190102100101-Big Creek	14,964	12.7	0.08
Stikine River-Frontal Stikine Strait	49,577	41.9	0.08
Falls Creek	26,381	22.3	0.08
Outlet Hamilton Creek	21,151	17.5	0.08
Pat Creek-Frontal Zimovia Strait	62,732	49.1	0.08
Sitkum Creek	8,919	6.7	0.08
Baht Harbor-Frontal Sumner Strait	28,802	20.2	0.07
Hamilton Bay-Frontal Keku Strait	10,473	7.3	0.07
Dean Creek-Frontal Frederick Sound	7,152	5.0	0.07
Goose Cove	23,087	11.6	0.05
190102101201-Sumner Mountains	9,003	4.4	0.05
Cathedral Falls Creek	17,153	7.5	0.04
Fools Inlet-Frontal Ernest Sound	20,507	8.1	0.04
Gunnuk Creek	9,696	3.6	0.04
Thoms Creek	11,816	4.0	0.03
Big John Creek	13,176	4.4	0.03
Saint John Harbor	16,584	5.4	0.03
Earl West Creek	10,011	3.1	0.03
Rocky Bay-Frontal Clarence Strait	12,824	2.4	0.02
North Arm-Frontal Frederick Sound	40,261	7.0	0.02
190102101103	15,053	2.5	0.02
Chichagof Pass-Frontal Stikine Strait	50,724	8.5	0.02
Chipp Peak-Frontal Frederick Sound	11,573	1.8	0.02
190102100502	15,290	2.1	0.01
Anan Creek	35,506	4.6	0.01
Pinta Point-Frontal Frederick Sound	21,984	2.1	0.01
Headwaters Hamilton Creek	9,820	0.8	0.01
Mosman Inlet-Frontal Rocky Bay	23,748	1.6	0.01
Headwaters Castle River	28,370	1.8	0.01
Snow Passage-Frontal Clarence Strait	20,954	1.1	0.01
Irish Creek	30,345	1.5	0.00
Ketili River-Stikine River	33,839	1.3	0.00
Petersburg Creek	31,954	1.2	0.00
Tunehean Creek	24,851	0.7	0.00
Bohemian Range-Frontal Frederick Sound	19,429	0.5	0.00
Big Creek	15,752	0.3	0.00

Watershed name	Watershed acres	Infested acres	% Watershed infested
Kikahe River	22,952	0.5	0.00
Twelvemile Creek	7,353	0.1	0.00
Andrew Creek	35,812	0.2	0.00
Washington Bay-Frontal Chatham Strait	14,020	0.1	0.00

All watersheds in the project area received a Watershed Condition Classification score of "functioning properly", all had water quality scores of "good", the highest rating in the classification scheme, and the majority had riparian condition scores of "good". Several watersheds had lower riparian condition scores, primarily due to impacts of timber harvest within riparian areas prior to passage of the 1990 Tongass Timber Reform Act (TTRA), which subsequently provided buffer protection for all fish-bearing streams. The majority of the six watersheds with the lowest riparian condition scores have mixed land ownership, with previous impacts including timber harvest, energy development, and municipal maintenance.

A number of watersheds within the project area should be considered "priority" treatment watersheds from an aquatics perspective due to the consistently high management indicator metrics in tables throughout this report. These include the Stikine River-Frontal Sumner Strait, HUC#190102090201-Helen Peak, HUC#190102090301, North Arm Duncan Canal-Frontal Duncan Canal, Anita Bay, Saint John Harbor, and Anan Creek watersheds.

Water Quality

Waters in Alaska are protected for all uses according to standards outlined in the Alaska Water Quality Standards (ADEC 2008). Numeric criteria standards are established according to protected use classes and subclasses. The Alaska Integrated Water Quality Monitoring and Assessment Report provides information on water bodies within the state that do not fully or partially support their designated beneficial uses, known as the 303(d) list. None of the streams in the project area, including nearby waterbodies, are included on this list of impaired waters (ADEC 2008).

Sedimentation and Turbidity

Water quality data including suspended sediment and turbidity data is available through historic United States Geological Survey (USGS) stream gauges for a small portion of the streams in the project area. Due to the lack of water quality data specific to individual treatment sites, sedimentation and turbidity assessments are necessarily qualitative. Changes in turbidity are assumed to occur concurrent with increases in suspended sediment; therefore effects related to "sedimentation" in this analysis represent changes in the water quality parameters of suspended sediment and turbidity. Generally, in Southeast Alaska, suspended sediment loads in non-glacial streams in undisturbed watersheds are very low (Schmeige et al. 1974).

Percentage of watershed area comprised of roads has been used to help quantify the risk of flow-related impacts to aquatic systems, including sediment introduction into streams (Cederholm et al. 1980). Similarly, metrics associated with roads can serve as a surrogate for estimating potential risk of herbicide delivery to streams in this analysis. Currently, approximately 972 miles of roads occur in project area watersheds (189 miles decommissioned). This estimate includes all roads, NFS and temporary, ever built regardless of age. Road densities are very low in watersheds

containing the highest acreage of targeted weeds in riparian areas such as reed canarygrass (*Phalaris arundinacea*) and common brassbuttons (Table 23).

Table 23. Road Density and % Watershed as Roads in watersheds with the highest individual site infestations (acres) of weeds targeted in riparian areas.

Watershed name	Watershed size (mi^2)	Existing road (miles)	Road density (mi^2/mi)	% Watershed as Roads[1]
North Arm Duncan Canal-Frontal Duncan Canal	48.0	11.8	0.2	0.2
190102090201-Helen Peak	11.2	5.2	0.5	0.3
Chichagof Pass-Frontal Stikine Strait	79.3	30.1	0.4	0.3
Anan Creek	55.5	0.0	0.0	0.0
Anita Bay-Frontal Zimovia Strait	27.1	18.1	0.7	0.5
Saint John Harbor	25.9	36.9	1.4	1.1
190102090301	24.9	30.0	1.2	0.9
Stikine River-Frontal Stikine Strait	77.5	13.7	0.2	0.1

[1] Percent Watershed as Roads calculated as: {(Existing road miles * 5,280ft/mi*40ft (assumed clearing width) / 43,560 ft^2/acre) / watershed size (acres)} * 100

Riparian Condition

Riparian areas encompass the zone of interaction between aquatic and terrestrial environments associated with streamsides, lakeshores, and floodplains, and display distinctive ecological conditions characterized by high species diversity, wildlife value, and resource productivity (USDA Forest Service 2008b). Riparian vegetation generally ranges from emergent plant communities, to mosses, lichens, liverworts, ferns, grasses, sedges and rushes, alder, and conifer-dominated tree stands. Riparian areas have high species diversity, wildlife value, and resource productivity, and are the primary areas potentially affected by weed removal within this analysis. Approximately 249 acres of targeted weed infestations occur within RMAs within the project area, with the largest sites occurring in the North Arm Duncan Canal-Frontal Duncan Canal watershed (common brassbuttons), and the Helen Peak watershed (reed canarygrass) (Table 24).

Table 24. Total targeted weed infestation acreage within RMAs of Class I, II and III streams.

Watershed name	Infested acres within RMA
North Arm Duncan Canal-Frontal Duncan Canal	104.5
190102090201-Helen Peak	31.9
Stikine River-Frontal Stikine Strait	20.0
190102090301	18.3
Baht Harbor-Frontal Sumner Strait	11.6
Chichagof Pass-Frontal Stikine Strait	7.0
Rowan Bay-Frontal Chatham Strait	5.0
Saint John Harbor	4.8
Anan Creek	4.6
Pat Creek-Frontal Zimovia Strait	4.4
Dean Creek-Frontal Frederick Sound	4.0

Watershed name	Infested acres within RMA
Ohmer Creek-Frontal Blind Slough	3.8
Portage Bay-Frontal Frederick Sound	2.8
Goose Cove	2.7
Anita Bay-Frontal Zimovia Strait	2.6
Falls Creek	1.9
North Arm-Frontal Frederick Sound	1.9
Outlet Hamilton Creek	1.8
Blind River	1.5
Big John Bay-Frontal Rocky Pass	1.4
Colorado Creek-Frontal Wrangell Narrows	1.4
Ketili River-Stikine River	1.0
190102101201-Sumner Mountains	0.9
Woodpecker Cove-Frontal Sumner Strait	0.9
190102100101-Big Creek	0.8
Cathedral Falls Creek	0.8
Salamander Creek	0.7
Keku Strait-Frontal Frederick Sound	0.7
Fools Inlet-Frontal Ernest Sound	0.6
Petersburg Creek	0.5
Kikahe River	0.5
190102101103	0.4
Thoms Creek	0.4
Snow Passage-Frontal Clarence Strait	0.4
Hamilton Bay-Frontal Keku Strait	0.3
Big Creek	0.2
Andrew Creek	0.2
Mitkof Island-Frontal Frederick Sound	0.2
Tunehean Creek	0.2
Irish Creek	0.2
Towers Arm-Frontal Duncan Canal	0.1
Bohemian Range-Frontal Frederick Sound	0.1
Chipp Peak-Frontal Frederick Sound	0.1
Twelvemile Creek	0.1
Earl West Creek	0.1
Washington Bay-Frontal Chatham Strait	0.1
Big John Creek	0.1
Total	**248.6**

The estuarine riparian area occurs at the mouths of watersheds with estuarine landforms (located along inlets and deltas at the head of bays). Water level fluctuations, channel morphology, sediment transport, and water chemistry are influenced to some degree by saltwater inundation in

these environments. Riparian areas in these environments can be several hundreds of feet wide on large river deltas and generally consist of saltwater marshes, meadows, mudflats, and gravel deltas that are depositional environments. Stream channels within estuaries are usually single to multiple thread channels, shallowly entrenched, and poorly constrained, with finely textured alluvium easily eroded by currents and wave action. As such, these environments are highly sensitive to upstream disturbances. Sedge and grass communities dominate the riparian vegetation. The interplay of the above factors results in the relative condition of a particular riparian site.

Riparian vegetation stabilizes stream banks and acts as a filter to prevent the runoff of soil into streams. Riparian vegetation also provides large and small wood to streams, adding to habitat complexity and providing cover and food sources for aquatic organisms. Aquatic ecosystems have evolved with certain vegetation types; weeds do not necessarily provide similar habitat.

Approximately 64 acres of reed canarygrass are mapped along streams and wetlands in the project area. Reed canarygrass is extremely aggressive and often forms persistent monocultures in wetlands and riparian areas. Infestations threaten the diversity of these areas, since the plant chokes out native plants and grows too densely to provide adequate cover for small mammals and waterfowl. Where reed canarygrass grows in water, it can slow the movement of water carrying sediment and lead to increased siltation along drainage ditches and streams. Once established, reed canarygrass is difficult to control because it spreads rapidly by rhizomes.

Treatment sites within or adjacent to Class I salmon streams would be a high-priority when determining annual treatment locations due to the potential threat to important anadromous stream habitat. Approximately 18.5 acres of reed canarygrass are located within Class I RMAs, with the largest known single infestations occurring in the Helen Peak and Chichagof Pass-Frontal Stikine Strait watersheds. The largest single infestation of any targeted aquatic plant is 104 acres of common brassbuttons, in the estuary of Bohemian Creek in the North Arm Duncan Canal watershed (Table 25).

Table 25. Watersheds with the largest individual infestations for targeted aquatic / riparian weed species.

Watershed name	Weed species common name	Infested acres
North Arm Duncan Canal-Frontal Duncan Canal	common brassbuttons	104.5
HUC# 190102090201-Helen Peak	reed canarygrass	31.9
Chichagof Pass-Frontal Stikine Strait	reed canarygrass	5.0
Anan Creek	reed canarygrass	4.6
Anita Bay-Frontal Zimovia Strait	reed canarygrass	2.0
Saint John Harbor	reed canarygrass	1.7
Saint John Harbor	reed canarygrass	1.2
HUC# 190102090301	reed canarygrass	1.0
HUC# 190102090301	reed canarygrass	0.9
Stikine River -Frontal Stikine Strait	reed canarygrass	0.6

The effect of weed treatments on riparian site conditions is evaluated among alternatives in this analysis.

Roads

Roads are one of the primary vectors for weeds to enter the project area. Roads and disturbed areas near roads, such as recreation sites, administrative sites, and skid trails in young growth forest are the most common area. Native soil has been removed along roads, and fill and surfacing have been placed within the road prism. The road drainage network has been implicated as a potential sediment source to stream channels (Wemple and Jones 2003; Wemple et al. 1996; Megahan and Kidd 1972; Reid and Dunne 1984). Sediment delivery can be used as a surrogate for herbicide delivery. Ditches may extend the stream network and act as delivery routes or intermittent streams during high rainfalls, or as settling ponds following rainfall events. The potential exists for roadside ditches to transport herbicides into the stream network, particularly in areas where broadcast treatments along roads have been used (broadcast spraying is not proposed in this project) (Wood 2001).

Herbicide may be used in or along roadside ditches in Alternative 2. Treatment acres along these ditch lines in any watershed are low and sites are scattered across large road and stream networks. Since this project does not propose the use of broadcast spraying herbicides in any alternative, the potential for herbicide to collect in ditches and enter streams in concentrations of concern is low.

Proximity to stream crossings is one of the primary determinants of exposure to herbicide properties, with the most significant exposure occurring at or near confluences with perennial streams (USDC National Marine Fisheries Service 2007). Because these locations represent points of likely encroachment into riparian areas, the number of stream crossings within a watershed can help assess risk of spread. Culverts with infestations of targeted weed species within a 60-foot diameter of the culvert were assessed during roadside surveys (Table 26). The largest infestations of targeted species within proximity to culverts were dominated by wall hawkweed, a type of yellow hawkweed. These are medium-sized roadside populations in the #190102090301 and Baht Harbor-Frontal Sumner Strait watersheds (15.4 and 11.3 acres respectively) in the Wrangell Ranger District. The primary proposed control for these populations is to use an aquatic-based version of glyphosate in combination with hand pulling, depending on site conditions. Not all stream crossings are located on roads having a higher risk for herbicide delivery.

Table 26. Summary of the ten watersheds with the highest number of stream crossings within 60 feet of known populations of target species within the project area.

Watershed name	Stream crossings	Infestation size (acres)
Big John Bay-Frontal Rocky Pass	18	0.3
Outlet Hamilton Creek	17	0.5
Portage Bay-Frontal Frederick Sound	13	0.3
Ohmer Creek-Frontal Blind Slough	11	0.3
190102090301	7	17.8
Baht Harbor-Frontal Sumner Strait	7	11.8
Pat Creek-Frontal Zimovia Strait	6	0.8
Blind River	5	0.2
Chichagof Pass-Frontal Stikine Strait	5	6.5
Colorado Creek-Frontal Wrangell Narrows	5	0.1

Municipal Watersheds and Domestic Water Supplies

The Alaska Department of Environmental Conservation (ADEC), Division of Environmental Health's Drinking Water Program formed a Drinking Water Protection group. This group completes Source Water Assessment Reports for all public water systems (groundwater and surface water) and helps develop Drinking Water Protection Plans for all Community and Non-Community Water Systems (ADEC 2013a). ADEC's Drinking Water Program requires Public Water Systems (PWS) to be in compliance with the state drinking water regulations, in accordance with the Federal Safe Drinking Water Act and Amendments. Three different categories of PWS supply water to consumers, including the community water system, which is a system expecting to serve, year round, at least 25 individuals; a non-transient non-community water system, which regularly serves the same 25 or more individuals for at least 6 months of the year; and the transient non-community water system, which regularly serves at least 25 individuals each day for at least 60 days of the year (ADEC 2013b).

The Drinking Water Protection Group completes Source Water Assessment reports which delineate the boundaries of source drinking water, identify risks to contamination, and determines the vulnerability of the source drinking water (ADEC 2013a).

Drinking water protection zones are classified A – F, with protection strategies dependent on existing and potential contaminant sources throughout a community.

Several PWS occur within the project area with mapped protection zones "A" and "B" (ADEC 2013c). Zone "A" depicts a 1,000-foot buffer area around surface waters supplying public water sources, while zone "B" depicts a larger 1-mile buffer area. The public water supply for the Wrangell Borough occurs in the Pat Creek-Frontal Zimovia Strait watershed. The water supply for the Petersburg Borough is located in the Colorado Creek-Frontal Wrangell Narrows and Mitkof Island-Frontal Frederick Sound watersheds, and the Kake water supply is located in the Gunnuk Creek watershed. All of these watersheds contain known populations of reed canarygrass, a species targeted for removal due to its effect on aquatic systems. Proposed weed treatments in proximity to public water systems are discussed in each alternative below. Before any weed management activities in PWS source watersheds are authorized, ADEC, and the affected municipality, and /or owner/operator of the water system must be consulted (USDA Forest Service 2008b, App. C-2). Herbicide treatments within 1,000 feet of a municipal water supply or public water source must be coordinated with the water user, manager, or local Municipal Water board.

The project design features (PDFs) for herbicide use are outlined in Chapter 2. By following these PDFs and project best management practices (BMPs), proposed weed treatments within PWS watersheds will not create or maintain a condition that has a significant potential to cause or allow the pollution or contamination of a public water system.

3.5.3 Environmental Effects

The ability to actually measure changes in suspended sediment, turbidity, temperature, or other water quality parameters in response to weed treatments is extremely limited due to the lack of baseline data and the natural range of variability of these parameters in response to climate and other factors. Nonetheless, sufficient information is available in the literature to proceed with a credible comparison of the magnitude and extent of likely effects across alternatives. For each resource topic covered (water quality, riparian condition) the analysis includes a brief description of the affected environment and an evaluation of effects. Potential impacts are described in terms

of type (beneficial or adverse), context (site-specific, local or regional), duration (short-term or long-term) and intensity (are the effects negligible, minor, moderate or major) (Table 27).

The following definitions were used to evaluate the effects of the proposal, and to compare alternatives for water quality, fisheries, and riparian condition:

- Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
- Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition.
- Direct: An effect that is caused by an action and occurs in the same time and place.
- Indirect: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.
- Short-term: An effect that within a short period of time would no longer be detectable as the resource is returned to its pre-disturbance condition or appearance. Short-term impacts may range from a few hours up to 10 years.
- Long-term: A change in a resource or its condition that does not return the resource to pre-disturbance condition or appearance and for all practical purposes is considered permanent.

Exceptions to these definitions are noted as applicable, since they are not a perfect fit for all effects.

Table 27. Thresholds for potential impacts to each aquatic resource for each level of intensity.

Aquatic resource	Negligible	Minor	Moderate	Major	Impact duration
Water quality	Neither water quality nor hydrology would be affected, or changes would be either undetectable or if detected, would have effects that would be considered slight, detectable only at the site.	Changes in water quality or hydrology would be measurable, although the changes would be small and localized to the site or affected stream reach. No mitigation measure associated with water quality or hydrology would be necessary.	Changes in water quality or hydrology would be measurable at the stream reach or sub-watershed scale. Mitigation measures associated with water quality or hydrology would be necessary and the measures would likely succeed.	Changes in water quality or hydrology would be readily measurable at the stream reach or sub-watershed scale, and would have substantial consequences. Mitigation measures would be necessary and their success would not be guaranteed.	Short-term refers to recovery in less than several days. Long-term would refer to recovery, following treatment, requiring longer than several months.
Riparian condition	Any effects to the RMA would be below or at the lower levels of detection. Any detectable effects would be slight.	Effects to RMAs would be detectable, site-specific and relatively small and short-term to individual plants.	The effects to RMAs would be detectable and readily apparent. The effect could be site-specific or over a relatively large localized area.	Effects to RMAs would be observable over a relatively large localized or regional area. The character of the RMA would substantially change.	Short-term refers to a period of less than 10 years. Long-term refers to a period longer than 10 years.

Herbicide Transfer Vectors

Potential for contamination and degradation of water quality are influenced by many factors including infestation size, herbicide type, application rate and method, proximity to water, soil composition, and rainfall following application.

Drift and Runoff

Drift is the most likely vector for herbicides coming in contact with water from riparian area or emergent vegetation treatment sites. The potential for drift varies with the herbicide application method. Drift is primarily associated with broadcast treatments, which are not being proposed in this project. Spot and hand application methods substantially reduce the potential for loss of non-target vegetation because there is little potential for drift.

Herbicide can also move from the treatment location into adjacent areas through runoff from slopes, roads, and ditches. Roadside ditches can act as herbicide delivery routes to streams during high rainfalls or as settling ponds following rainfall events.

Previous Monitoring Results

Berg (2004) compiled monitoring results for broadcast herbicide treatments given various buffers along waterbodies. The results showed that any buffer helps lower the concentration of herbicide in streams adjacent to treatment areas. In California, when buffers between 25 and 200 feet were

used, herbicides were not detected in monitored streams (detection limits of 1to 3 mg/m3) (Berg 2004).

Imazapyr has been shown to exhibit a rapid rate of decay in both water and sediment after application to estuary mud. In a study evaluating imazapyr in aquatic environments, imazapyr was applied at 1.5 pounds acid equivalent per acre to a plot of bare mudflat approximately 100 feet by 100 feet in the upper intertidal zone of Willapa Bay in Washington (Patten 2003). Herbicide applications were made 1.5 hours after the tide receded from the site. When the tide came in 3.1 hours after treatment, water samples were collected. The quantity of imazapyr remaining in the water approached zero by forty hours after application and the quantity remaining in sediment approached zero by four hundred hours following application. Similarly, in a study where imazapyr was aerial sprayed without a buffer, the stream concentration was 680 mg/ml. With a 15-meter buffer, the concentration was below detectable limits (Berg 2004).

In a study to assess whether herbicide use along road shoulders was a significant contributor to the load of herbicides carried by streams in Oregon, runoff associated with several herbicides including sulfometuron methyl and glyphosate was tested (Wood 2001). Rainfall was simulated at rates of 0.33 inches an hour at 1, 7 and 14 days after treatment in the spring; in the fall the road was again sprayed and the ditch line was checked during natural rainstorms for 3 months. Samples collected on the road shoulder in the spring had concentrations of nearly 1,000 ppb of glyphosate that could potentially leave the shoulder. Glyphosate was not found at the shoulder, ditch line or stream after spraying in the fall. This study suggests the greatest risk of herbicides moving off site occurs from large storms soon after herbicide application.

Berg (2004) also reported that herbicide applied in or along dry ephemeral or intermittent stream channels may enter streams through runoff if a large post-treatment rainstorm occurred soon after treatment. This risk is minimized if intermittent and ephemeral channels are buffered as would occur under the Proposed Action. If a large rainstorm occurs, sediment contaminated by herbicide could be carried into streams. Since most ditches within the project area are heavily vegetated, this is less likely to occur than in a drier environment.

The Washington State Department of Agriculture (WSDA) in partnership with the Washington State Department of Ecology over the past decade, have monitored pesticide residues in surface waters from selected urban and agricultural watersheds in order to assess pesticide presence and concentrations in salmon-bearing streams. Results of the most recent triennial report for pesticides in salmon-bearing streams indicate pesticide levels measured at most study sites were rarely found at concentrations above aquatic life criteria or water quality standards (WSDA 2011).

Accidental Spill

Concentrations of herbicides in the water as a result of an accidental spill depend on the rate of application and the streams' ratio of surface area to volume. The persistence of the herbicide in water depends on the length of stream where the accidental spill took place, velocity of stream flow, and hydrologic characteristics of the stream channel. The concentration of herbicides would decrease rapidly down-stream because of dilution and interactions with physical and biological properties of the stream system (Norris et al. 1991).

Project design features reduce the potential for spills to occur, and if an accident were to occur, minimize the magnitude and intensity of impacts. The ADEC pesticide use permit contains transporting requirements addressing spill prevention and containment.

Effects Common to All Action Alternatives

Water Quality

Water quality considerations common to both action alternatives include potential sedimentation, turbidity, and temperature changes. The potential effect of herbicides on aquatic resources is confined to Alternative 2. The potential to influence water quality parameters is minor due to the small portion of any watershed that would be treated. These potential effects are discussed below.

The Alaska State water quality standards anti-degradation policy states that existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected, and that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality must be maintained and protected unless the State allows the reduction of water quality for a short-term variance (ADEC 2012).

Sedimentation

Sediment can be introduced into streams from natural and management-related processes, including mechanical weed treatments. Short-term increases of suspended sediment and turbidity can be expected from the removal of vegetation and exposure of bare soil.

Manual and mechanical treatments along stream banks could accelerate sediment delivery to streams through ground disturbance. However, only a small portion of the treatment areas are located in stream-side environments, therefore ground disturbance is not a significant concern. Modification of surface ground cover can also change the timing of runoff.

Mechanical control can be very effective for new infestations of weeds and when populations are few in number. The localized soil disturbance from mechanical removal of weeds could reduce soil stability until plants have reestablished on the disturbed sites, which could result in reduced water quality in drainages after significant rain events. This impact would be minimized by tamping the soil back into place after removal of the weeds and by using this method only on small infestations. Mechanical control is expected to have short-term, negligible, localized, and adverse impacts on water quality or quantity.

Cultural control would have a minor, long-term, beneficial impact on water quality by returning native vegetation to currently infested areas. Low-risk methods are not likely to be used, but could include covering plants "tarping" with plastic sheeting. Aquatic and riparian treatment areas comprise a very small portion of any watershed for both action alternatives and are relatively short-lived. The methods discussed above could have a negligible, short-term, localized, adverse impact on water quality. Project PDFs and pesticide permit stipulations will help mitigate this potential.

Temperature

Two ecological mechanisms related to weed treatments can potentially lead to increased stream temperatures. Removal of riparian vegetation and the resultant increase in solar radiation has been shown to increase stream temperatures (Beschta et al. 2000), and the replacement of woody riparian shrubs and trees by plants like reed canarygrass can increase stream temperature and alter stream channel morphology (Lavergne and Molofsky 2004; Fierke and Kauffman 2006). Due to the small areas of potential aquatic and riparian treatment sites using manual, mechanical and cultural methods, the effect to changes in stream temperatures would be negligible, short-term and localized.

Riparian Condition

Weeds can adversely affect the functioning of riparian areas. The primary weed species of concern occurring within the RMA is reed canarygrass. This plant is known to disrupt native wetland plant communities, alter stream flow and degrade wildlife habitat (Lyons 1998). Reed canarygrass is a circumboreal plant that is reported to have dramatically increased in abundance in temperate North America approximately 40-60 years ago in response to increased soil nitrogen enrichment, impaired hydrology, and construction impacts to wetlands (Lavoie et al. 2005). Reed canarygrass is thought to have been introduced to Southeast Alaska as a forage and stabilization species. Most populations of reed canarygrass are associated with human disturbances, such as boat launches, roads, bridges, and recreation sites. Reed canarygrass has, however, spread from these locations along river corridors. Although most reed canarygrass populations within the project area are currently small, if their growth and spread is unchecked, the likelihood they will adversely affect aquatic systems increases. In other parts of its range, reed canarygrass often dominates the shorelines of lakes, ponds, rivers, and wetlands, hindering regeneration of woody and herbaceous native plant communities and reducing habitat suitability for some animal species. When reed canarygrass encroaches into active channels it can accelerate siltation of rock and sand bars, reduce the active-channel area, and alter fluvial dynamics (Comes et al. 1981; Heutte et al. 2003). These changes to stream geomorphology may contribute to reduced suitability for salmonids.

Reed canarygrass can begin to spread vegetatively shortly after seedling establishment. A dense network of rhizomes capable of excluding the growth of other species can form within a single growing season. Although seedling establishment of reed canarygrass is restricted to high-light canopy gaps, rhizomes often extend into low-light areas (Maurer and Zedler 2002). Reed canarygrass establishment from seed is typically much greater in saturated than flooded soils. It can, however, invade under a wide range of hydrologic conditions by shifting its growth strategy (Conchou and Pautou 1987). Tussock-forming plants allocate more resources to shoots than roots, an advantage under flooded conditions. As water-levels recede, these plants shift allocation to favor lateral spread. This "plastic response" to hydrology allows reed canarygrass to be better suited to water-level fluctuations occurring at a magnitude and frequency greater than many other perennial wetland species. High nutrient additions also favor reed canarygrass over other species.

Himalayan blackberry and Japanese knotweed can act as a sediment trap and fish barrier. Japanese knotweed has poor bank holding capacity, which leads to more bank erosion and sedimentation of streams in high winter flows (Shaw and Seiger 2003). While knotweed may provide shade, native streamside hardwoods and conifers are much taller, therefore knotweed dominated areas may be associated with higher water temperatures than areas with native forest communities. Knotweed can spread rapidly due to its ability to reproduce vegetatively. Root and stem fragments, as small as ½ inch can form new plant colonies. Seasonal high water events and floods sweep plants into rivers and creeks, then fragment and disperse knotweed plant parts throughout the floodplains and cobble bars. The fast growing knotweed then takes advantage of the freshly disturbed soil to become established. Because it grows faster than most other plant species (including native species and most other weeds) it quickly outgrows and suppresses or kills them (Soll 2004). Currently, no known populations of Himalayan blackberry occur within the project area, and approximately 0.2 acres of Japanese knotweed occurs in the Wrangell District on Koenig Slough near the mouth of the Stikine River. Blackberry is on the Tongass "watch list" and would be approached using an early detection-rapid response (EDRR) strategy to treatment (see below).

Native vegetation growth may change as a result of infestation, and the type and quality of litter fall, and quality of organic matter may decline, which can alter or degrade habitat for aquatic organisms. Primary and secondary consumers that form the basic food source for fish and other aquatic organisms may be indirectly affected. Reed canarygrass infestations threaten the diversity of these areas, since the plant chokes out native plants and grows too densely to provide adequate cover for small mammals and waterfowl. If these populations continue to grow without treatment, they would likely continue to spread. Where they spread, banks could become less stable leading to changes in suspended sediment, and substrate character and embeddedness. Potentially this could lead to diminished pool frequency and quality.

Treating weeds such as reed canarygrass that have colonized along stream channels and out-competed native species would improve overall riparian condition.

Early Detection-Rapid Response (EDRR)

All action alternatives would use the EDRR approach for new or unknown infestations. This approach is necessary because the precise locations of individual target plants, including those mapped in the current inventory are subject to rapid and/or unpredictable change, and the typical NEPA process would not allow for rapid response; infestations may grow and spread into new areas during the time it usually takes to prepare NEPA documentation. The intent of the EDRR approach is to treat new infestations when they are small so the likelihood of adverse treatment effects is minimized. The approach is based on the premise that the impacts of similar treatments are predictable, even though the precise location or timing of the treatment may be unpredictable. Regardless of the treatment method used (manual, mechanical, cultural, herbicide, EDRR) the annual 200 acre treatment cap will ensure effects remain within those analyzed in the direct, indirect and cumulative effects analysis.

Effects by Alternative

Both of the action alternatives have the potential to influence water quality and riparian condition as discussed below, but effects are expected to be minor due to the small portion of any watershed that would be treated. Treating weeds would improve riparian stability where plants such as reed canarygrass have colonized along stream channels and out-competed native species. All weed treatments bear some risk that removing plants could exacerbate stream instability; the annual treatment plan accounts for these areas and prescribes mulching, seeding and planting as needed to revegetate riparian and other treated areas.

No direct application of herbicide to water is intended in any alternative; however weed treatments along water's edge near wetlands or stream channels may result in some herbicide entering surface waters.

Alternative 1 – No Action

Direct and Indirect Effects

The treatment program for the Petersburg and Wrangell Ranger Districts would continue in a similar manner as the past 5 years. This includes a continuation of weed treatments cleared in other NEPA documents (e.g., CEs for weed treatments at administrative and recreation sites). Alternative 1 would not preclude future weed management in the project area. It assumes that only those weed infestations currently being treated would continue to be treated.

Less-active management, changes in plant composition and structure resulting from weed encroachment would be indirect, localized, and adverse to water quality and riparian condition.

Where shallow-rooted weeds such as hawkweed, replaced deep-rooted native perennial plants in uplands, especially native graminoids, potential for soil erosion and waterway sedimentation would increase. Reed canarygrass could replace woody riparian shrubs and trees, alter stream channel morphology, and increase stream temperature (Lavergne and Molofsky 2004; Fierke and Kauffman 2006). Reed canarygrass, as well as Tongass watch list species such as Bohemian knotweed and Himalayan blackberry could replace riparian vegetation, change channel morphology, and reduce stream productivity (Urgenson et al. 2009).

Cumulative Effects

Cumulative effects on water and riparian resources in the project area are expected to increase in the long-term as a result of this alternative. Impacts of weeds are currently negligible in most locations due to the limited area collectively occupied. Impacts of weeds in some areas, however, including the East Salt Chuck in Duncan Canal and recreation sites along the Stikine River are expected to change from negligible to moderate over the long-term as the area of weed occupation and influence on aquatic systems increases.

Conclusion

The ecological impact of this alternative is considered moderate, since untreated populations of weeds would continue to spread unabated with the effects of such spread lasting into the foreseeable future. Absent management, abundance and distribution of invasive weed species is expected to increase over time. Negative effects on aquatic and riparian systems would increase in the long-term as a consequence. As a result, Alternative 1 would result in moderate, long-term, adverse effects in relatively large localized areas resulting from the expected spread of invasive weeds, particularly reed canarygrass and common brassbuttons.

Alternative 2 – Proposed Action

Direct and Indirect Effects

<u>Water Quality</u>

Alternative 2 applies a high degree of caution to herbicide use. The types of application methods proposed (spot and hand application) have low potential to harm beneficial uses of water. The closer to water the treatments are the more limited the choice of specific herbicide ingredients and the manner they may be applied. Although there would be no herbicide applied directly to the water column for purposes of treating submerged vegetation, fine droplets from spot applications may come in contact with water as a result of treating emergent vegetation. The two herbicide properties that most affect the potential to contaminate surface or groundwater are solubility and persistence. Most herbicides for terrestrial uses should not be applied directly to water or to areas where surface water is present. A few exceptions of forestry herbicides labeled for aquatic areas include glyphosate formulations, and imazapyr formulations such as Habitat® or Ecomazapyr 2 SL® (Osiecka and Minogue 2010).

The Environmental Protection Agency mandates that the maximum contaminant level (mcl) for picloram and glyphosate is 0.5 and 0.7 mg/liter, respectively. The Alaska State water quality standards and antidegradation policy states that concentrations of toxic substances in water may not exceed the numeric criteria for aquatic life for fresh water and human health for consumption of aquatic organisms shown in the Alaska Water Quality Criteria Manual or any chronic and acute criteria established for a toxic pollutant of concern to protect sensitive and biologically important life stages of resident species (ADEC 2012a). Additionally, no concentrations of toxic substances in water or in shoreline or bottom sediments that reasonably can be expected to cause adverse

effects on aquatic life or produce undesirable or nuisance aquatic life can be exceeded (ADEC 2012a).

The herbicides proposed for use in this alternative and their potential effects to water quality beneficial uses are described below.

Aminopyralid

It is improbable that aminopyralid applications would measurably degrade water quality due to herbicide properties and application location, type, and method. Aminopyralid has low to moderate solubility in water, degrades rapidly in sunlit water, and is considered to be of exceptionally low toxicity to invertebrates and vertebrates (SERA 2007b). Consequently, if aminopyralid reached surface waters, it would be rapidly dispersed, and would be unlikely to cause any acute or chronic impairment of invertebrates and vertebrates. Any residual herbicide reaching the soil surface would be retained and biodegraded within the upper 12 inches of soil. Potential for offsite egress of the herbicide would be further minimized by adherence to label requirements and best safety practices. Potential for contamination of water via airborne drift of small droplets of herbicide, leaching to groundwater, or surface and subsurface runoff would be minimized by restriction to directed foliar backpack spray application, spray tank pressurization sufficient to achieve large spray droplet size, prohibition on spray application within 10 feet of water bodies, and application to dry sites when wind is minimal.

Glyphosate

Glyphosate would be used to manage weed species unaffected by aminopyralid (e.g., grasses). It also would be used to manage any weed species at sites occurring adjacent to surface water, such as reed canarygrass. Like aminopyralid, potential for water contamination would be low due to herbicide properties and application location, type, and method. This herbicide was designed to be applied to emergent weeds in all bodies of fresh and brackish water which may be flowing, non-flowing, or transient (Monsanto 2005). Glyphosate adsorbs strongly to soil particles once it enters the water, and this strong adsorption prevents excessive movement in the environment (Schuette 1998). Glyphosate is highly water soluble, with a half-life in water ranging from 35-63 days, and degradation in water is generally slow, since fewer microorganisms occur than in soil (Schuette 1998). Directed foliar backpack sprayer, cut-stem, or injection methods of application would be used as appropriate. In contrast to application of aminopyralid, application of glyphosate would be allowed for formulations registered for use near and over water. Mobility and transport of residual glyphosate would be limited because most would bind with organic matter and sediment in soils and water. Residual herbicide would be mostly dissipated and biodegraded within 2 months in upland soils and within 2 weeks in water (SERA 2003a). The area subject to potential influence would be limited to infestation sites. Additionally, the potential for water quality degradation would diminish through progressive reduction of infestation and application area. Glyphosate use would be limited to commercial aquatic formulations that do not contain the surfactant POEA (i.e., polyethoxylated tallow amine), which has been shown to be toxic to some aquatic organisms. However, surfactants such as AGRI-DEX®, the least toxic of the glyphosate-compatible surfactants to aquatic organisms and fish studied to date, would be added to promote glyphosate efficacy (Monheit 2004).

Imazapyr

Imazapyr is a non-selective herbicide used for control of a broad range of weeds including riparian and emergent aquatic species. It is very highly water soluble, has moderate mobility in soils and toxicity of aquatic-based versions to fish and aquatic species is low. Degradation of this herbicide is influenced by many factors, but increases with increased temperatures, increased soil

moisture, and decreased clay and organic matter content. The primary form of degradation in water is photodegradation, with a half-life of approximately 2 days. This generally results in lower concern for water contamination due to its rapid photodegradation by sunlight. Imazapyr has been used to control emergent plants like reed canarygrass, which would be the likely target plant in this project. Bioaccumulation of imazapyr in aquatic organisms is low; therefore the potential of exposure through ingestion of exposed aquatic invertebrates or other food sources to fish is reduced. Toxicity to fish is considered practically non-toxic (insignificant) based on tests conducted using standardized EPA protocols (SERA 2011a).

Manual and Chemical Control

Effects of manual methods would differ between Alternative 2 and Alternative 3. Impacts would be consistent with those described in under "Effects Common to All Action Alternatives" where manual methods would be applied exclusively to manage infestations comprising a few invasive plants (e.g., 10 or fewer per infestation area). With larger infestations the impacts of manual methods would decrease in Alternative 2 from minor, short-term negative effect to a negligible, short-term effect. Soil erosion and sedimentation potential would be substantially reduced in Alternative 2 because soil and protective vegetation cover would not be as severely disturbed in order to remove weed roots. Instead, herbicide would be used to kill weeds while leaving most of the cover of non-target plants intact with one exception. On sites where weeds dominate ground cover, killing the weeds with herbicide could temporarily remove most of the protective ground cover of vegetation. In such a case, potential for erosion and sedimentation would temporarily increase then decline as cover of non-target vegetation increased.

Chemical control can be very effective for large infestations of weeds and for plants with growth habits that make mechanical control methods ineffective. If herbicides used for chemical control would be applied near water, it would only be herbicides labeled for such use and would be applied in accordance to label specifications and project design features (PDF) to minimize overspray. Herbicide buffer recommendations limiting the rate and method of application were developed considering the toxicity and environmental behavior of the three herbicides proposed in this project. These buffers are the same as those developed for herbicides approved in the Olympic National Forest invasive plant treatment FEIS and ROD on site-specific weed treatments (USDA Forest Service 2008a). Buffers are intended to allow for the maximum flexibility in herbicide use to treat all known situations in the project area, while minimizing risk of herbicide delivery to streams and adverse effects to water quality, fish, and the aquatic ecosystem.

Municipal Watersheds and Domestic Water Supplies

Coordination with municipal water boards and users would occur and herbicide use within 1,000 feet upstream (slope distance) of known water intakes would be coordinated with the water manager or land owner. Herbicide use would not occur within 200 feet of surface waters draining to a public water supply. Given the types of herbicide proposed and the manner they would be used, no plausible scenarios leading to drinking water contamination sufficient to affect public health are anticipated in this alternative. Concentrations of herbicides capable of reaching groundwater or streams are low and below levels of concern for people.

The potential to affect beneficial uses of waters near public water systems is minimized through pesticide permitting application requirements, project design features, and BMPs. In all alternatives, existing municipal watershed agreements would be followed.

Cumulative Effects

The impact to water quality from multiple actions conducted at multiple sites over a period of years would be negligible. This consequence is attributed mainly to the limited projected area of treatments; limited mobility of residual herbicide in the environment; minimal toxicity of herbicides to invertebrates and vertebrates; relatively rapid dissipation and biodegradation of herbicides; the annual 200-acre treatment limit (including EDRR); and the application of BMPs and PDFs to minimize risk of water contamination. Since most documented infestations occur in uplands, new infestations would also likely occur primarily in uplands and few would occur in seasonal or semi-permanently flooded sites. Despite expected success at reduction and elimination of currently known infestations, new infestations will likely be identified and some would require treatment with herbicide. Herbicide use could therefore be required over the long-term and water quality would continue to be negligibly affected. Current infestations are expected to decrease in extent with treatment. As a result, the potential for soil erosion and sedimentation is also expected to decrease with time in treated areas.

Conclusion

Proposed uses of herbicide would result in a minor, short-term negative effect. However, this effect would decline to a negligible level corresponding with rapid reduction in size of infestations and herbicide usage in years following initial herbicide application, as discussed above. By removing weed species, native plant communities will be restored. This is expected to have positive effects on water quality, and diminish the potential for increased sedimentation and altered instream habitat resulting from the presence of weed species. With implementation of the mitigation measures (Chapter 2), the use of chemical control would result in negligible, short-term, localized, potentially adverse impacts on water quality. Long-term, the effects of herbicide application are expected to be negligible, localized, and beneficial to water quality and riparian condition.

Alternative 3 - Integrated Weed Management without Herbicide

Direct and Indirect Effects

Under this alternative, weeds would continue to be primarily controlled by manual and mechanical (hand tool) methods. Sites with larger infestations would receive more soil disturbance due to mechanical control when compared to small infestations. The localized soil disturbance from manual or mechanical removal of weeds could reduce soil stability until plants have reestablished on the disturbed sites, which could result in reduced water quality in drainages after significant rain events. This potential impact would be minimized by tamping the soil back into place after removal of the weeds. Weed infestations located in riparian areas would not be effectively controlled under this alternative due to the large amount of time required to manually remove populations; therefore riparian condition may decline due to the lack of treatment in certain areas.

Application of manual and mechanical methods would likely result in a negligible, localized, adverse effect on riparian condition and water quality over the short-term. Potential would be low for topsoil to erode and flow into surface waters due to minimal soil disturbance associated with removal of weeds in small infestations located in upland settings, even when repeated removals were required over a period of years. However, treatment of large infestations could potentially cause a minor, short-term impact. This would be attributed to an increased potential for soil erosion due to the increase in disturbance area associated with removal of topsoil and weed roots. Additionally, topsoil would need to be disturbed repeatedly over a period of years to ensure

complete removal of rhizomatous perennial weeds. Slope pitch and density of vegetation following weed removal also would influence erosion potential. Finally, the probability that eroded sediment would enter and temporarily degrade water quality would be related to the distance between the treatment area and water body. Treatment of infestation areas closest to water bodies would have the greatest potential to produce sediment that could affect water quality.

Cumulative Effects

The impact of combined actions conducted at multiple sites over a period of years would be minor. This is attributed primarily to the limited area where application of manual and mechanical methods (including EDRR infestations) would potentially increase soil erosion and resulting sedimentation into adjacent water bodies. Level of impact of weed species would remain relatively consistent since the area subject to treatment would not appreciably change, particularly with reed canarygrass since removal of this plant is very difficult using these methods. Future funding levels and personnel available to support treatment of the maximum 200-acre annual limit on the highest priority sites is currently unknown. As such, the area requiring treatment could eventually exceed available resources. In such a scenario, weeds populations would expand, and water quality and riparian condition could be adversely affected following conversion from native plants to non-native weed species.

Conclusion

Proposed use of solely manual and mechanical methods for control of weeds would result in a negligible, short-term, adverse effect to water quality and riparian condition for small infestations. Long-term, adverse effects would increase with an anticipated increase in infestation size, as discussed above. Native plant communities would be improved in areas conducive to these removal techniques, with the associated long-term benefits to water quality and riparian condition. However, the more likely scenario, considering the two primary weeds targeted in aquatic environments (reed canarygrass and common brassbuttons) do not lend themselves to these removal techniques, is an increase in overall population size. Such an increase would lead to a corresponding higher, long-term risk to water quality and riparian condition, due to the increased potential for sedimentation and altered physical habitat on channel margins and riparian areas. Consequently, Alternative 3 would have minor, long-term, adverse effects in relatively large localized areas resulting from the expected spread of reed canarygrass and common brassbuttons.

3.5.4 Design Features and Mitigation

Design features intended to minimize the potential impacts of herbicide use on aquatic resources are listed in Section 2.5.2. These criteria would be implemented, as necessary, according to the annual weed treatment plan (see Appendix B).

3.6 Aquatic Organisms and Essential Fish Habitat (EFH)

3.6.1 Introduction

Weeds found growing adjacent to or within aquatic influence areas can invade, occupy and dominate riparian areas and indirectly impact aquatic ecosystems and fish habitat. Weeds can change stand structure and alter future inputs of wood and leaves that provide the basic foundation of the aquatic ecosystem food webs. Native vegetation growth may change as a result

of infestation, and the type and quality of litter fall, and quality of organic matter may decline, which can alter or degrade habitat for aquatic organisms.

The impacts of weeds on the environment can last decades, while the impacts of treatment tend to be short-term (1 year or less). Passive and active restoration would accelerate native vegetative recovery in treated sites.

The effect of herbicide use on project area aquatic organisms and essential fish habitat as a result of chemicals reaching streams and other water bodies through drift, leaching or run off was identified as an internal and public issue. The primary determinants of exposure of herbicide to aquatic organisms are herbicide properties, application rate, extent of application, application timing, precipitation amount and timing, and proximity to habitat (USDC National Marine Fisheries Service 2007). The Proposed Action would minimize potential for herbicide delivery to surface waters and wetlands.

3.6.2 Affected Environment

Existing Condition

The project area contains two-hundred twenty-three 6th-level HUC watersheds which contain approximately 3,081 miles of Class I stream (anadromous fish) and 1,819 miles of Class II (resident fish only streams). There are approximately 222 acres and 16 species of targeted weed infestations within riparian management areas (RMAs) near and along Class I and II streams in the project area. Approximately 151 acres of weed infestations occur along Class I streams and 71 acres occur along Class II streams. RMA distances range from 100 to 140 feet from the bankfull width of a stream depending on the process group of the stream (see the Hydrology resource report (Whitacre 2013) for more information on RMAs and process groups). Targeted weed infestations can occur anywhere from the water's edge up to 140 feet horizontal distance perpendicular to a stream depending on process group of the stream.

Reed canarygrass is the primary target species of concern in riparian areas. Approximately 57 acres are mapped near and along Class I and II streams in the 3.6 million-acre project area.

A target species in the marine environment is brassbuttons which has approximately 105 acres mapped on National Forest System lands along the shoreline above the mean high tide mark. No treatment is proposed outside of National Forest System lands (e.g., below mean high tide).

Indigenous fish species important to recreational, subsistence, personal use, and commercial fishing within the project area include coho salmon (*Oncorhynchus kisutch*), pink salmon (*Oncorhynchus gorbuscha*), Chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*Oncorhynchus nerka*), and chum salmon (*Oncorhynchus keta*), steelhead trout (*Oncorhynchus mykiss*), coastal cutthroat trout (*Oncorhynchus clarki clarki*), and Dolly Varden char (*Salvelinus malma*) (Johnson and Blanche 2010). Fish populations within the project area are managed and protected by the Alaska Department of Fish and Game sport fishing regulations, personal use regulations, and daily harvest limits. Subsistence fishing is managed by the Federal Subsistence Board of Fish.

Amphibian species present in the project area include the northwestern salamander (*Ambystoma gracile*), long-toed salamander (*Ambystoma macrodactylum*), roughskin newt (*Taricha granulosa*), western toad (*Bufo boreas*), and the Columbia spotted frog (*Rana luteiventris*) (MacDonald 2010).

Sensitive, Threatened, and Endangered Species

Several of the fish species present in the project area are threatened and endangered in the Pacific Northwest. However, they are not federally listed as threatened and endangered within the project area (USFWS 2013). The Southeast Alaska distinct population segment (DPS) of Pacific herring is a candidate species in consideration for listing under the Endangered Species Act (USDC National Marine Fisheries Service 2013). Candidate species are treated as Forest Service sensitive species. No amphibian species in the project area are listed.

Aquatic Habitat

Aquatic habitat in the project ranges from highly productive floodplain channels to less productive high gradient upper valley channels. Productive channels throughout the project area provide quality spawning and rearing habitat for fish species present. The Stikine River is the largest river system within the project area.

Essential Fish Habitat

EFH is defined as "those waters and substrates necessary for fish spawning, breeding, feeding, or growth to maturity." Marine EFH in Alaska includes estuarine and marine areas from tidally submerged habitat to the 200-mile exclusive economic zone (EEZ). Freshwater EFH includes streams, rivers, lakes, ponds, wetlands and other bodies of water currently and historically accessible to salmon. EFH for Pacific salmon recognizes six critical life history stages: (1) spawning and incubation of eggs, (2) juvenile rearing, (3) winter and summer rearing during freshwater residency, (4) juvenile migration between freshwater and estuarine rearing habitats, (5) marine residency of immature and maturing adults, and (6) adult spawning migration. Habitat requirements within these periods can differ significantly and any modification of the habitat within these periods can adversely affect EFH.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH).

3.6.3 Environmental Effects

Effects Common to All Action Alternatives

Manual and Mechanical Methods

Manual and mechanical weed treatments occurring near streams and wetlands pose risk of disturbing the aquatic ecosystem and may result in minor, short-term disturbances to fish and other aquatic organisms, increased sedimentation and erosion, and increased temperature by removal of vegetation. These effects are expected to be minimal as weed treatments would primarily take place on the stream banks with no treatments within the water itself. None of the known target weed infestations occurring near streams are known to offer shade, and the amount of vegetation to be removed is not large enough to measurable affect stream temperature. In addition, project design features (PFDs) would identify and mitigate any potential effect through site-specific design considerations.

Early Detection-Rapid Response (EDRR)

Under the EDRR approach, included in the action alternatives, new or previously undiscovered infestations would be treated using the range of manual and mechanical methods described in this EA (Section 2.4.5), and according to the PDFs developed for this project. The ever-changing

distribution of weeds makes this a necessary component of the ranger districts' treatment program.

The effects to the aquatic environment from treating unknown future populations would be similar to the effects of treating the known inventory. PDFs would be applied and non-herbicide methods would continue within riparian areas and along higher-risk road segments. Non-herbicide treatments of aquatic emergent vegetation could result in increased sedimentation and erosion. Such disturbances may be more frequent in Alternative 3 than the Proposed Action due to the lack of treatment effectiveness and presumable increased need for repeated treatments. However, none of the treatments in Alternative 3 are likely to adversely impact aquatic organisms due to the low occurrences of weeds in riparian areas over such a large project area.

Direct, Indirect and Cumulative Effects by Alternative

The degree of risk to aquatic organisms and their habitat (including EFH) varies from herbicide and non-herbicide treatments. All action alternatives minimize or avoid adverse effects to some degree. None of the alternatives would likely result in direct mortality to fish or measurable, observable impacts to EFH.

Alternative 1 – No Action

Direct and Indirect Effects

Under the No-Action Alternative, none of the activities proposed from the action alternatives would be implemented. However, the treatment program for the Petersburg and Wrangell Ranger Districts would continue in a similar manner as the past 5 years. This includes a continuation of weed treatments cleared in other NEPA documents (e.g., CEs for weed treatments at administrative and recreation sites). Alternative 1 would not preclude future weed management in the project area. It assumes that only those weed infestations currently being treated would continue to be treated.

If no additional activities occur, weed populations will continue to grow and spread within riparian areas of the Wrangell and Petersburg Ranger Districts and may out-compete native riparian plant species and reduce the productivity of these important areas. Overall there will be a negative impact if no additional actions are taken.

Cumulative Effects

Cumulative effects in the project area are not expected to change as a result of this alternative. Impacts of weeds are currently negligible in most locations due to the limited area collectively occupied by weeds. Impacts of weeds in some high-use areas, however, are expected to increase over the long-term as the area of weed infestation and influence on aquatic systems increased.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Manual and mechanical treatments could lead to localized sedimentation and turbidity to fish habitat because of trampling and soil sloughing due to stepping on banks and removal of weed roots. The amount of localized sediments and turbidity would be negligible because weed populations along streams and near estuaries on the Wrangell and Petersburg Ranger Districts are not extensive enough to result in significant sedimentation and turbidity. Effective weed treatment

and restoration of treated sites would improve the function of riparian areas and lead to improved fish habitat conditions.

Removal of weed populations offering shade could increase temperature but a significant amount of vegetation would need to be removed to have this effect. None of the known target weed infestations occurring near streams are known to offer shade, and the amount of vegetation to be removed is not large enough to measurably affect stream temperature.

People working in water have the potential to impact fish by stepping on redds and disturbing spawning fish. Treatments occur along creek banks up to water's edge. Treatments would be scheduled to avoid disturbance of spawning fish or damage to redds.

The above effects are expected to be less for this alternative than Alternative 3 because herbicide treatment effectiveness would be greater than manual and mechanical treatments and there would be a presumable reduced need for repeated treatments.

Although herbicides used for aquatic weed control have been shown to affect aquatic species, concentration of herbicides coming in contact with water following land-based treatments in this project is unlikely to be great enough to cause detrimental effects. Sub-lethal effects from glyphosate can include changes in behaviors or body functions that are not directly lethal to the aquatic species, but could have consequences to reproduction, juvenile to adult survival, or other important components to health and fitness of the species. Sub-lethal effects could also result from substantial changes to habitat or food supply. The amount of glyphosate proposed for use near water is minimal; therefore this is unlikely to happen. Only spot-spray and hand/select application methods are proposed in this project which further minimizes the potential for herbicide delivery to streams. Additionally, glyphosate is tightly bound to soil and the presence of organic matter in the soil limits the amount of glyphosate that is transported away from target areas to streams. No sub-lethal effects are expected from imazapyr or aminopyralid due to their low toxicity to fish, amphibians, and invertebrates. By following PDFs and label requirements any sub-lethal effects to aquatic organisms are expected to be minimized or eliminated.

Imazapyr has the potential to harm aquatic plants and algae. The amount of herbicide that could be delivered is relatively low in comparison with levels of concern from SERA Assessments and the duration to which any non-target organism (including aquatic plants) would be exposed is very short-lived. Any impacts would be very localized and most likely occur only at or very near the point the herbicide entered a waterbody.

Effects of herbicides to EFH would be minimal due to the small amount used near streams, low number of infestations near streams and marine environments, and using only aquatic labeled herbicides to water's edge.

This project would use only low-risk aquatically approved surfactants (e.g. Agri-Dex®, Class Act® NG®, Competitor®). This feature would eliminate potential impacts from surfactants that have high levels of Polyoxyethyleneamine (POEA), which at high levels can have adverse effects to aquatic species.

Early Detection-Rapid Response

Effects of treatments each year under EDRR, by definition, would not exceed those predicted for the most ambitious conceivable treatment scenario (200 acres per year, for 10 years). This is because the PDFs minimize or eliminate the potential for adverse effects. Effects of treatments under EDRR would be sufficiently minimized by the PDFs regardless of when the treatments

occurred. If effective treatments of new infestations required methods outside the scope of the project, or if PDFs could not be applied without a significant loss of effectiveness, further analysis would be necessary prior to treatment.

Cumulative Effects

The proposed activity would not contribute to any cumulative adverse effects for aquatic organisms or EFH. Currently the Alaska Department of Transportation in Wrangell and Petersburg are not using herbicide treatments along any roads they maintain. No known herbicide treatments are occurring on adjacent lands. Adjacent private land owners could be using herbicide to treat weeds on their property but the scale would be extremely small. The scale of this project is extremely small overall (limited to 200 acres per year not to exceed 2,000 acres treated during 10-year life of the project within the 3.6 million acre project area). Other activities that may occur in the project area include timber harvest and road building. The weed management activity when combined with potential future activities such as timber harvest and road building would not contribute to any cumulative adverse effects to aquatic organisms and EFH due to lack of herbicide use in these other types of projects, the minimal direct and indirect effects to aquatic organisms, and the inclusion of specific project design features.

Conclusion

Effects of herbicides and manual and mechanical treatments to aquatic organisms and EFH would be minimal due to the low number of infestations occurring within RMAs near Class I and II streams and along shorelines of the project area. Currently there are only 222 known acres of targeted weeds within RMAs of the 3.6 million acre project area. Imazapyr and aminopyralid have a low toxicity to aquatic organisms and are not expected to cause any adverse effects if they came in contact with aquatic organisms. However, there could be some very localized effects to aquatic plants and algae with the use of imazapyr. Glyphosate may cause sub-lethal effects to fish. Interception of herbicide by vegetation and organic matter limits these potential effects. Additionally, only spot-spray and hand select application methods are proposed in this project which further limits the potential for herbicides to reach streams. Any increase in sediment from minor ground disturbance would be so small as to be negligible and would not contribute to accumulation of downstream sediment. By removing weeds, native plant communities would be restored. This is expected to have positive effects on aquatic habitat and diminish the potential for altered instream habitat resulting from the presence of weeds. Effects are expected to be further minimized through the project design features listed above that were developed to protect aquatic resources.

Alternative 3 - Integrated Weed Management without Herbicide

Direct and Indirect Effects

Manual and mechanical weed treatments occurring near streams and wetlands pose risk of disturbing the aquatic ecosystem. This type of treatment may result in minor, short-term disturbances to fish and other aquatic organisms, increased sediment and erosion, and increased temperature. Such disturbances may be more frequent in this alternative than the Proposed Action due to the lack of treatment effectiveness and presumable increased need for repeated treatments. However, none of the treatments in Alternative 3 are likely to adversely impact aquatic organisms or EFH due to the small and limited infestations within riparian areas. Effects are expected to be further minimized through project design features.

Early Detection and Rapid Response

The effects to the aquatic environment from treating unknown future populations would be similar to the effects of treating the known inventory. PDFs would be applied and non-herbicide methods would continue within RMAs and along higher risk road segments. Non-herbicide treatments of aquatic emergent vegetation could result in short-lived, localized disturbance to redds, increases in sediment and erosion, and increases in temperature. Such disturbances may be more frequent in Alternative 3 than the Proposed Action due to the lack of treatment effectiveness and presumable increased need for repeated treatments. However, none of the treatments in Alternative 3 are likely to adversely impact aquatic organisms or EFH due to the small and limited infestations within riparian areas.

Cumulative Effects

The lack of potential significant adverse direct and indirect effects from treatments under Alternative 3 reduces the potential for cumulative effects, even when this project is considered with other past, present and future projects. Sediment from minor ground disturbance would be so small as to be negligible and would not contribute to accumulation of downstream sediment.

Conclusion

Effects from manual and mechanical treatments could result in short-lived, localized disturbance to redds, increases in sediment and erosion, and increases in stream temperature. This would occur more in this alternative than the Proposed Action due to lack of treatment effectiveness and the need for repeated treatments. These effects are expected to be so minor as to be negligible due to the low treatment acres in riparian areas and effects are expected to be further minimized through project design features.

3.6.4 Design Features and Mitigation

Herbicide treatments would be applied in accordance with label advisories, USDA Forest Service policies, Forest Plan management direction, BMPs, human health and ecological risk assessments (SERA), and applicable PDFs identified in this document. These specific PDFs would be applied to minimize or eliminate the potential for weed management to adversely affect aquatic organisms and EFH. All herbicides considered under the Proposed Action have human health and ecological risk assessments that are posted on the Forest Service website http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

A National Pollutant Discharge Elimination System (NPDES) 402 CWA Pesticide Permit will be obtained from the State of Alaska prior to any herbicide use near water bodies. All applicators of herbicides will be certified through the State of Alaska.

3.7 Wilderness

3.7.1 Introduction

The effect of weed treatments on Wilderness character was identified as an internal and public issue. For this analysis, a qualitative discussion about the direct, indirect and cumulative effects of manual, mechanical and chemical treatments on Wilderness character is provided.

3.7.2 Affected Environment

Existing Condition

The 5.7 million acres of Wilderness on the Tongass National Forest was established under the 1980 Alaska National Interest Lands Conservation Act (ANILCA) and the 1990 Tongass Timber Reform Act (TTRA), which subsequently amended ANILCA. In ANILCA, Congress reaffirmed and expanded upon the purposes of Wilderness as stated in the 1964 Wilderness Act, specifically for Wilderness established in Alaska. In recognition of unique situations and established uses in Alaska, ANILCA also provided a number of important specific exceptions to the prohibitions of the Wilderness Act. These included exceptions related to subsistence, access, and public use cabins among others (USDA Forest Service 2008c, pp. 3-444 to 3-445).

There are five Wildernesses in the project area totaling 302,564 acres. The Stikine-LeConte, Tebenkof Bay, Petersburg Creek-Duncan Salt Chuck Wildernesses were designated in 1980 under ANILCA, and the South Etolin and Kuiu Wildernesses followed in 1990 through TTRA.

Although weeds are present in Tongass Wilderness areas, they are currently not widespread. The majority of known infestations are very small (consisting of 1-2 plants). There are approximately 134 acres of documented weed infestations within the five Wildernesses in the project area (Table 28).

Weeds have been discovered in sites that have attracted human use in the past and continue to attract use by modern visitors. Fox farms, cabin sites, canneries, and campsites are typical places where weeds can be found, either from native or homesteader gardens or by unintentional transport of plants through items brought to the site. Reed canarygrass and dandelion have also been found in remote locations (USDA Forest Service 2009, p. 5). Spread of these weeds can continue through seeding, dispersal by animals and wind, and transport on shoes, clothing and gear.

Some eradication has occurred in various sites. Hand-pulling and tarping are the most common methods and have been accomplished in an opportunistic fashion. Most treatments have occurred in small areas, with individual plants or scattered spots. No herbicide use or burning has occurred in the Wilderness.

Petersburg Creek-Duncan Salt Chuck Wilderness

Petersburg Creek-Duncan Salt Chuck Wilderness is located on Kupreanof Island. Consisting of 46,849 acres, its unique features include Duncan Salt Chuck, a salt marsh influenced by tide, and Petersburg Creek which flows through a glacier-carved valley.

Human influences include two Forest Service recreation cabins and a National Recreation Trail (the Petersburg Lake Trail) composed of boardwalk which leads to the Petersburg Lake Cabin. The Portage Mountain Trail takes visitors from Petersburg Lake to Salt Chuck East Cabin. Three isolated (personal use) cabin permits are also currently authorized for this Wilderness.

Known weeds in this Wilderness include reed canarygrass along the access trail near the lake cabin and another in an undeveloped site across the lake. Brassbuttons occur in the Salt Chuck estuary, which is the largest infestation in project area (104 acres). Other documented weeds include perennial ryegrass, Kentucky bluegrass, white clover, common dandelion, plantain, creeping buttercup and purple foxglove.

In the past, hand pulling of reed canarygrass has occurred along the trail, at the lake and cabin, and of brassbuttons near the East Salt Chuck cabin.

South Etolin Wilderness

This 83,371-acre Wilderness is located on Etolin Island and also includes some small islands in the Inland Passage. Mount Etolin, at 3,700 feet, is the highest point. This Wilderness is undeveloped, with no recreation cabins or trails. However, impacts to the natural quality of its Wilderness character have occurred with the 1987 introduction of Roosevelt and Mountain elk, which are not native to the area. Local residents use the area for subsistence and recreation, and there is some use at high lakes, accessible by floatplane.

The South Etolin Wilderness has one known weed infestation. Starting in 2005, there have been 8 yearly surveys. A small population of orange hawkweed, *Hieracium aurantiacum*, at South Brownson Island was treated with tarp and black plastic from 2004-2009. Since the tarp's removal, the area has been monitored yearly. In 2012, less than ten seedlings were identified and pulled. Orange hawkweed is thought to have been introduced by recreational campers.

Stikine-LeConte Wilderness

This 44,951 acre Wilderness includes the Stikine River, which has long been an important transportation corridor for Native Americans, miners, fur traders and settlers. It continues to attract traffic from the commercial fishing industry, miners, hunters, outfitters offering jet boat rides and people recreating. LeConte Glacier, located within the Wilderness, is North America's southernmost tidewater glacier. Other places unique to the Wilderness include the Tongass National Forest's highest peak (Kate's Needle, 10,002 feet), the Forest's largest ice field, and a large spring concentration of bald eagles.

This Wilderness has the most developments of any in the project area. Impacts to the undeveloped quality are clustered along the river shore and include 12 Forest Service recreation cabins, 16 cabins under special use permit, several administrative cabins used by different state and federal agencies, a developed hot springs, two hiking trails, and a swimming area. Administrative use of chainsaws and power winches is allowed for clearing navigational hazards within semi-primitive motorized areas and specifically for maintaining navigation along the Stikine River. Permits for an AT&T passive reflector and for a stream gauge are currently issued for this Wilderness.

Weeds noted in this Wilderness include orange hawkweed, reed canarygrass, European mountain ash, creeping buttercup, Kentucky bluegrass, common dandelion, sweetclover, plantain, sneezeweed, timothy, wall hawkweed, sheep sorrel, alsike clover, white clover, common chickweed and Japanese knotweed. Hawkweed has been treated by tarping at a special use cabin on Limb Island. Reed canarygrass has been tarped and pulled in other locations including near Rynda Cabin and Gut Cabin and the hot springs slough and meadow, and along the Clearwater River. European mountain ash has been treated using cutting and digging and knotweed has been tarped in various locations.

Tebenkof Bay Wilderness

This Wilderness, totaling 66,812 acres and adjacent to the Kuiu Wilderness, includes many small islands and numerous small bays and coves. The Troller Islands are one of the most productive fishing grounds in Southeast Alaska. The commercial fishing fleet uses the waters extensively during the respective fishing seasons.

Impacts to Wilderness character include one isolated cabin permit and remains of former settlements.

Small weed populations of white clover, red clover, dandelion, timothy, plantain and foxglove have been documented in various locations of this Wilderness including Lisa Point, Step Island and East Island. All are associated with prior human use, including cabin and fox farm sites.

Kuiu Wilderness

Kuiu Wilderness area is comprised of 60,581 acres south of the Tebenkof Bay Wilderness on Kuiu Island. The eastern boundary is along the waters of Sumner Strait and the western boundary is along Chatham Strait. Its shoreline is characterized by three major bays (Port Malmesbury, Affleck Canal, and Port Beauclerc) and several small islands.

Human influences include a portage trail from Affleck Canal which crosses the area and provides access to Petrof Bay in the Tebenkof Bay Wilderness.

A single Japanese knotweed plant was pulled from Edwards Island in 2005.

Table 28. Wilderness areas within the project area and acres of documented weed infestation.

Wilderness area	Size of Wilderness (acres)	Acres of weed infestation
Petersburg Creek-Duncan Salt Chuck[1]	46,849	107.7
South Etolin	83,371	<0.1
Stikine-LeConte	44,951	22.8
Tebenkof Bay[2]	66,812	3.9
Kuiu	60,581	0
Total Wilderness acres	**302,564**	**134.4**

[1] Acres of infestation includes 2.27 acres of reed canarygrass on the south side of Petersburg Lake that have not yet been entered into the GIS database.

[2] These acres have not yet been entered into the GIS database.

Desired Condition

Wilderness Character

The Wilderness Act does not define Wilderness character, but according to Landres et al. (2005), Wilderness character may be described as the "combination of biophysical, experiential, and symbolic ideals that distinguish Wilderness from all other lands". There are four qualities of Wilderness that may be used to approximate Wilderness character for the purposes of monitoring changes to its character over time. These qualities, which were identified based on the Definition of Wilderness, Section 2(c) from the 1964 Wilderness Act, and are described below, are equally important and reinforce one another.

Untrammeled

The Wilderness Act states that Wilderness is "an area where the earth and its community of life are untrammeled by man" and "generally appears to have been affected primarily by the forces of nature." This quality refers to Wilderness being essentially unhindered and free from modern human control or manipulation.

Undeveloped

The Wilderness Act states that Wilderness is "an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation." The undeveloped quality refers to the presence of structures, construction, habitations, and other evidence of modern human presence or occupation, including the development level of trails and campsites.

The undeveloped quality also refers to the absence of mechanical transport and motorized equipment. Wilderness was partly established "in order to assure that…growing mechanization, does not occupy and modify all areas within the United States…" (Wilderness Act, Section 2a).

Natural

The Wilderness Act states that Wilderness is "protected and managed so as to preserve its natural conditions." This quality refers to the intended and unintended effects of modern people on ecological systems inside Wilderness since the time of designation.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation

The Wilderness Act states that Wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." This quality includes the values of inspiration and physical and mental challenge. Primitive recreation in Wilderness has largely been interpreted as travel by nonmotorized and nonmechanical means. It also encompasses reliance on personal skills to travel and camp in an area. Unconfined encompasses attributes such as self-discovery, exploration, and freedom from societal and managerial controls.

Other Features of Value

Forest Service policy direction states the following objectives for the management of Wilderness (FSM 2320.2):

1. Maintain and perpetuate the enduring resource of Wilderness as one of the multiple uses of National Forest System land.

2. Maintain Wilderness in such a manner that ecosystems are unaffected by human manipulation and influences so that plants and animals develop and respond to natural forces.

3. Minimize the impact of those kinds of uses and activities generally prohibited by the Wilderness Act, but specifically excepted by the Act or subsequent legislation.

4. Protect and perpetuate Wilderness character and public values including, but not limited to, opportunities for scientific study, education, solitude, physical and mental challenge and stimulation, inspiration, and primitive recreation experiences.

5. Gather information and carry out research in a manner compatible with preserving the Wilderness environment to increase understanding of Wilderness ecology, Wilderness uses, management opportunities, and visitor behavior.

3.7.3 Environmental Effects

Direct, Indirect and Cumulative Effects by Alternative

Alternative 1 – No Action

Direct Effects

If Alternative 1 is the selected alternative, the treatment program for the Petersburg and Wrangell Ranger Districts Wilderness areas would continue in a similar manner as the past 5 years: continued manual treatment of approximately 90 acres of weeds. However, only those weed infestations currently approved for treatment would continue to be treated (early detection-rapid response would not be implemented) and herbicide treatment would not be an option.

Although this alternative does not preclude future weed treatments within Wilderness, additional treatments would require individual NEPA analyses which would slow response time affecting native plant communities and ultimately Wilderness character. Also, without the ability to quickly respond to new infestations in and near Wilderness using early detection-rapid response as proposed in the action alternatives, weeds could continue to spread and impact Wilderness values. Visitors' experience may be diminished if they are aware of weeds. Weeds can negatively affect a wide array of environmental attributes that are important to support recreation, including but not limited to soil quality, water quality and quantity, plant diversity, availability of forage and cover, and animal diversity and abundance (Eiswerth et al. 2005).

Effects to Wilderness Character

Untrammeled:

Any treatment reduces the untrammeled quality of Wilderness because it is human control and manipulation of the Wilderness resource, although it would be undertaken to restore naturalness. Assuming there would be fewer weed treatments in Alternative 1, less trammeling would occur compared to the action alternatives.

Natural:

The natural quality would be less protected under this alternative. With less timely treatment options, weeds would continue to spread in some areas of the Wilderness, affecting ecosystem processes and visual integrity. The sense that Wilderness is an intact, properly functioning ecosystem would be compromised.

Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation:

Because fewer workers would be on site and popular camping and recreation areas would be less likely to be temporarily unavailable, impacts to visitor pursuits would mostly be unaffected. Administrative presence would remain unchanged.

Undeveloped:

There would be no impacts to the undeveloped quality, since no facilities would be built or removed.

Alternative 2 – Proposed Action

Direct Effects

Wilderness ecosystems would be exposed to herbicides and to the manipulation that would result from their use. There would be a risk of herbicide effects to non-target species. Ecosystem adaptations to weeds would be altered by human actions. The potential would be greatly reduced for weeds to alter natural plant communities, interact in unknown ways with native wildlife species, and alter ecological processes such as plant community dynamics and disturbance processes. The risk that weeds could irrevocably alter evolutionary processes would be greatly reduced.

People would be exposed to herbicides in Wilderness. Native species and natural ecosystems would be preserved; therefore, the sense that Wilderness is a predominately natural place would be retained.

People would likely see treatment activities or see the effects of them. Wilderness visitors could notice the effects of weed treatments, because browned out vegetation might be obvious. This evidence of treatment activities and effects would reduce the sense of solitude and that Wilderness is a place free from human manipulation. Weed treatments with herbicides can temporarily affect scenery if large numbers of target plants are together and are seen in the dying or dead phase. They would not be noticed the following growing season when the residual live, green native vegetation dominates the view.

Those who think it is most important that Wilderness be free from biophysical manipulation would strongly object to utilization of herbicides or other treatments and be greatly concerned about any effects they have to Wilderness. Those who most value natural conditions would likely tolerate use of herbicides if treatments show rapid and significant success in protecting and restoring natural conditions. Wilderness would be less likely to be viewed as a source of weeds that threaten surrounding lands, both National Forest System and private.

Effects to Wilderness Character:

<u>Untrammeled:</u>

Weed treatment reduces the untrammeled quality of Wilderness because it is human control and manipulation of the Wilderness resource, although it would be undertaken to restore naturalness. Chemicals would be introduced into the ecosystem, which represents more types of trammeling than proposed in Alternatives 1 and 3.

Tarping would have the most effect on this quality because the tarps remain in place for several years, representing a longer period of human manipulation.

The effects of using integrated treatments including chemicals would reduce the negative effects of this quality in the long-term. In some cases, spraying is the only method to eradicate certain species. Human manipulation of the environment would occur, but would be of shorter duration than tarping and hand-pulling. Less follow-up treatments would be required than in Alternative 3, reducing the longevity of human manipulation in this alternative.

Using EDRR, while still a trammeling action, would be less trammeling than in Alternative 1 because it emphasizes early detection of and response to new infestations and reduces their spread by using adaptive management, thus reducing the time period of human manipulation.

Natural:

Effective weed treatment would enhance the natural quality by restoring native vegetation and reducing the influence of non-native species on all components of the Wilderness resource. The use of herbicides introduces a chemical into the natural environment and is an adverse effect on the natural quality where it can affect non-targeted species, but is a short-term impact when compared to the long-term benefit of reduction of weeds.

Positive effects to the natural quality could be delayed for several years where tarping is used. The presence of the tarps detracts from the natural quality and can shade out native plants. Hand-pulling allows for soil disturbance and changes in the plant composition of the area. Since these treatments are not as effective for some plants, they may actually introduce additional undesired species into the Wilderness. However, under this alternative these methods would only be used to eradicate those species that respond best to these methods, so the impacts to the natural quality would be less and of shorter duration than under Alternative 3.

Using EDRR has a positive impact on the natural quality because it emphasizes early detection, effective treatment and removal of weeds.

Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation:

Due to the small populations of weeds, it is not anticipated that the presence of work crews would have a large impact on this quality. The presence of a crew in the field may be dictated by the species being treated, the method used, and the optimal time to administer the treatment. However, in some site-specific, popular locations, visitors may be temporarily displaced if they do not wish to recreate where treatments are taking place. This could occur where chemicals are being applied or where torching is occurring. Some sites could be closed to use while herbicide is being applied. The presence of tarps, which restrict movement by visitors and impairs the scenic value of the area, impacts this quality, although it would occur in only small portions of large Wilderness areas. Though it would occur at the same areas where visitors congregate and expect to use, the total acreage proposed per year is low in comparison to the amount that is available to visitors.

The impacts from tarping would be less than under Alternative 3 since tarps would only be used for species that are best eradicated in that manner. The impacts from hand-pulling are expected to be minor; although solitude may be affected in the short-term, this method would not typically prevent visitors from recreating.

Impacts to this quality would be of shorter duration than in Alternative 3 since integrated treatments are being used.

Undeveloped:

There would be no effect to the undeveloped quality since no facilities would be built or removed. No motorized equipment or mechanized transport is proposed under this alternative.

Indirect Effects

Some Wilderness users may be sufficiently concerned about herbicide use that they do not return to the areas where it is used. This displacement could funnel visitors to other, less used areas of the Wildernesses and create new impacts.

Cumulative Effects

Very little human manipulation has occurred or is expected to occur within these Wilderness areas, although past human presence in the form of historic structures, logging, gardens, and mining adits can be found. Trails and recreation cabins have been added to small portions of the Wilderness areas. In the often inclement climate of Southeast Alaska, most visitors depend on some of these features and tolerate their presence.

Reasonably foreseeable actions that cumulatively could affect solitude include the presence of field crews performing trail and cabin maintenance and biological surveys. Outfitter-guides will continue to utilize some of these same areas. These are expected to have only a minor effect because they are localized and short-term in nature.

Actions affecting the natural quality include the ongoing presence of elk in the Etolin Wilderness and associated management actions associated with that population. Ongoing camping, sightseeing and other recreation activities could continue to bring in weeds.

Under the Proposed Action, infestations would be detected and controlled early enough such that extensive treatments would not be necessary. Both natural- and human-caused ground disturbances and vectors of weed spread would still exist, however, since the sites where they are mostly found would be used into the future.

The amount of treatment that would occur in Wilderness is very minute compared to the size of the Wilderness. If the manual treatments were to occur at sites at the same time as any trail or cabin maintenance work, there may be an additive effect to a person's Wilderness experience because they could encounter more people than ordinary.

The cumulative effects of herbicide in Wilderness is expected to be minor due to the small amount of acreage proposed for treatment each year and because the herbicides proposed for use are low-risk and their presence does not remain in the environment for long periods of time.

Combined with the eradication efforts on existing sites, and early detection/rapid response to new sites, there would be a beneficial cumulative effect of keeping Wilderness free of weeds. There are no other major actions proposed or occurring in Wilderness.

Alternative 3 – Integrated Weed Management without Herbicide

Direct Effects

The direct effect of choosing this alternative is that in some cases weeds would continue to grow and spread in the Wilderness. The natural quality of Wilderness character would continue to be affected in those cases where plants cannot be controlled using tarping and hand-pulling.

Wilderness ecosystems would be free from herbicides and the manipulation that would result from this control method. There would be no risk of herbicide effects to non-target species. Ecosystem adaptations to weeds would be free from human interference. Effects of weeds would be determined by competitive and other interactions. In extreme cases, weeds could alter natural plant communities, interact in unknown ways with native wildlife species, and alter ecological processes such as plant community dynamics.

People would not be exposed to herbicides in Wilderness under this alternative, but would continue to experience the effects of weeds, such as noticeable changes to natural conditions and processes expected as part of a Wilderness setting. Not having the option to treat weeds with

herbicide in Wilderness could also result in a loss, or reduction, in the sense that Wilderness is a predominately natural place.

Competition and change introduced by weeds would continue. Those who believe that it is most important that Wilderness remain free from management that includes herbicides would favor this alternative. Those who believe that protecting natural conditions is most important would remain concerned about loss of native species and natural ecosystem processes, if these threats are present. Wilderness may be viewed as a source of weeds that threatens values on surrounding lands, both National Forest System and private.

Effects to Wilderness Character:

Untrammeled:

Weed treatment reduces the untrammeled quality of Wilderness because it is human control and manipulation of the Wilderness resource, although it would be undertaken to restore naturalness.

Of all the methods proposed, tarping would have the most effect on this quality because the tarps remain in place for several years, representing a longer period of human manipulation. Since tarping and hand-pulling are not as effective for some weeds, more follow-up visits and treatments means the impacts to this quality would occur over a longer time period than if a quicker method was used.

Natural:

Effective weed treatment would enhance the natural quality by restoring native vegetation and reducing the influence of non-native species on all components of the Wilderness resource. No chemicals would be introduced into the environment.

Positive effects to the natural quality could be delayed for several years due to the length of time these treatments take to be effective (particularly in the case of tarping). The presence of the tarps could affect wildlife movement, water dispersal, and can shade out native plants. Hand-pulling allows for soil disturbance and changes in the plant composition of the area. Since these treatments are not as effective for some plants, they may introduce additional undesired species into the Wilderness. In addition, these methods may not be practical or effective in treating some species or treating large infestations. In these cases, in particular with the large populations of reed canarygrass in the Stikine-LeConte Wilderness, the natural quality would not be enhanced under this alternative.

Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation:

Because the majority of weed populations in Wilderness are widely-scattered and less than 1 acre, impacts to this quality would be limited but would occur.

The presence of tarps, which restrict movement by visitors and impairs the scenic value of the area, impacts this quality, although it would occur in only small portions of otherwise large Wilderness areas. However, it would occur at the same areas where visitors congregate and expect to use.

Because these methods are not as effective in treatment as herbicide, impacts to solitude would occur on an annual basis as crews revisited the sites to repeat the treatments. Hand-pulling can take considerable time and effort, ensuring that a crew remains on site for a longer period of time. Visitors seeking solitude may be displaced from these areas while the treatment occurs.

Short-term impacts to this quality would be less under this alternative than under Alternative 2 since herbicide use would not occur with subsequent temporary closures of popular sites.

Because herbicides are not proposed under this alternative, it is probable that some highly invasive populations could occur and continue to spread. In some cases, this quality could be affected in site-specific areas if the plant's presence makes it difficult to hike, camp or recreate.

Undeveloped:

There would be no impacts to the undeveloped quality, since no facilities would be built or removed. No motorized equipment or mechanized transport is proposed.

Indirect Effects

Some Wilderness visitors may disperse to other locations where human manipulation is not as obvious, in particular from those areas where large tarps have been placed. In the long-term, the "Alaska experience", commonly thought of as a Wilderness experience with considerable opportunities for solitude and an intact ecosystem, could be compromised by weed spread.

Cumulative Effects

Cumulative effects are similar to Alternative 2, with the exception that under this alternative, cumulative impact to solitude would be greater due to the necessity of repeated visits for treatment of some weeds. Combined with other visitor encounters, a continuing outfitter-guide presence, and other forest workers, over the treatment period there would be less opportunity to experience solitude in the Wilderness areas.

Summary of Environmental Effects

Findings are summarized in Table 29 using numbers derived in the Minimum Requirements Decision Guide (MRDG) workbook for this project, located in the project record. The numbers in the table provide a comparison of the effects the alternative's actions may have on the qualities of Wilderness character. Negative numbers indicate a potential negative effect as a result of the alternative's activities and positive numbers indicate potential benefits. The overall Wilderness character rating for each alternative is a sum of its positive and the negative scores.

In general, Alternative 2 would have the greatest beneficial impact to Wilderness areas in the project area. Implementing Alternative 3 would benefit the natural quality of Wilderness more in the long-term than the No Action Alternative as the likelihood of weeds spreading would be greater if no treatments occur; however, the success rate would be more limited than in Alternative 2 and impacts to solitude would be greater than in Alternative 1. In the shorter term, naturalness would be impacted in Alternative 3 more than any of the other alternatives due to the presence of tarps and manual control lasting for several years with, in some cases, limited effectiveness. The possible negative effects of treating weeds in Wilderness would be similar for both action alternatives, with greater benefits when treatment includes the use of herbicides.

Table 29. Alternative comparison of proposed actions on Wilderness character.

Wilderness character	Alternative 1		Alternative 2		Alternative 3	
	Positive	Negative	Positive	Negative	Positive	Negative
Untrammeled	0	0	1	2	1	2
Undeveloped	0	0	0	0	0	0
Natural	0	2	3	1	0	3
Solitude or primitive and unconfined recreation	0	0	2	2	0	2
Other features of value	0	0	0	0	0	0
Totals	0	2	6	5	1	7
Wilderness character rating	**-2**		**1**		**-6**	

3.7.4 Design Features and Mitigation

Design features are intended to minimize the potential impacts of weed treatments on Wilderness character. See Section 2.5.2 for a list of design features for Wilderness areas.

3.7.5 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All alternative comply with the Forest Plan and other relevant laws to some degree. Each proposes a certain level of action to treat weeds. However, Alternatives 1 and 3 would only be partially successful in meeting the Forest Plan objective (USDA Forest Service 2008b, p. 2-8) of "Preserve and perpetuate biodiversity. Inventory and reduce or eliminate invasive species in Wilderness" due to the less effective methods of treatment to some weeds.

None of the alternatives propose the use of actions prohibited in Section 4c of the Wilderness Act.

3.8 Wildlife

3.8.1 Introduction

The potential effect of harmful herbicide exposure to wildlife, specifically threatened, endangered and sensitive bird and mammal species, was identified as an internal and public issue.

This analysis addresses the effects of the project on the wildlife management indicator species (MIS) in accordance with the Tongass Land Management Plan Revision FEIS (2008c, pp. 3-230 through 241 and 3-265 through 3-286), and threatened, endangered and proposed species (or their designated critical habitat) listed under the Endangered Species Act (ESA). There are no threatened or endangered species within the project area; however, there is one candidate species. This analysis also addresses the effect on sensitive species, which are identified by the Regional Forester due to population viability concerns on National Forest System lands within the region. The Forest Service Manual (FSM) states that viable populations and habitats of sensitive species will be maintained and distributed throughout their geographic range on National Forest System lands (FSM 2670.22).

3.8.2 Affected Environment

Existing Condition

The Tongass National Forest supports a rich array of wildlife species, providing habitat for approximately 54 species of mammals, 231 species of birds and 6 species of amphibians and 4 species of reptiles. The diversity of wildlife on the forest provides many opportunities for consumptive and non-consumptive uses including commercial, general and subsistence hunting; and photographic and viewing activities.

Rather than analyze for all wildlife species on the Tongass, the species reviewed are those which help predict the impacts to entire assemblages of species and those with population or habitat viability concerns.

Management Indicator Species

Management indicator species (MIS) are those wildlife species whose responses to land management activities reflect responses of other species with similar habitat requirements. As such, MIS are used to help predict the impacts to entire assemblages of species and associated habitats to assess population viability and biological diversity. They are also used to help establish management goals for game species and other species of public interest. The Forest Plan identifies 13 wildlife MIS on the Tongass National Forest.

Eight management indicator species were chosen for analysis in this project (Alexander Archipelago wolf, American marten, bald eagle, black bear, brown bear, red squirrel, river otter and Sitka black-tailed deer). The remaining five MIS (brown creeper, hairy woodpecker, mountain goat, red-breasted sapsucker and Vancouver Canada goose) have been excluded from analysis based on a determination that project activities would not impact their habitat (see Table 1 in Delabrue 2013).

Alexander Archipelago Wolf

The Alexander Archipelago wolf (*Canis lupus ligoni*) was selected as an MIS because of population viability concerns in some areas of the Tongass National Forest. In 1993, wolves were petitioned in Southeast Alaska; as a response to the petition, the US Forest Service adopted a series of Standards and Guides designed to maintain adequate prey and reduce mortality. In 2012, the wolves were yet again petitioned to be listed as endangered in Southeast Alaska (ADFG 2012). Changes in road access and deer habitat provide general measures of effects.

Wolves occur within all site types of the project area; however, their preferred habitat is closely tied to that of the Sitka black-tailed deer (i.e., the "forests" site type) since deer are their main source of food. Most documented weed sites occur in places that wolves use incidentally such as roadsides, rock pits and recreation sites. Current infestations occur on approximately 517 acres which amounts to less than 1 percent of the total available habitat for wolves.

American Marten

The American marten (*Martes americana*) is a furbearer game species selected as an MIS because forest management activities are expected to affect population abundance, and marten pelts represented significant economic value to local residents. Changes in road access and POG forest provide general measures of effects.

Martens are known to occur in the project area and are often associated with old-growth. This habitat is generally considered the "forests" site type. The areas where known infestations occur are likely used incidentally by martens.

American Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was selected as an MIS because of its use of coastal areas for foraging and nesting. Changes in productive old-growth (POG) forest, especially along the shoreline, provide a general measure of effects. In Southeast Alaska, bald eagles represent a species that depends on beach fringe forested habitat. These habitats equate to "forests", "wetlands" and "estuaries" site types. Forest Plan Standards and Guidelines require the protection of beach fringe habitat (USDA Forest Service 2008b, p. 3-239), and habitat surrounding nests is managed in accordance with an interagency agreement established with the US Fish & Wildlife Service (USDA Forest Service 2008b, p. 4-92).

According to GIS nest data provided by the US Fish & Wildlife Service, there are hundreds of nests located across the project area. These nests are not visited on a regular basis so the statuses of some nests are unknown. Due to the susceptibility of bald eagles to disturbance, a biologist would need to check the status and occupancy of any nest prior to any project activities. If a nest is active, a timing restriction would be followed.

American Black Bear

Black bears (*Ursus americanus*) were chosen as an MIS because of their importance for hunting, and for recreation and tourism. Changes in road access and POG forest, especially along salmon-bearing streams, provide general measures of effects.

Black bears can be found across the project area but in some areas they occur at much lower densities. They are known as habitat generalists and can be seen in areas where known plant infestations occur, such as roadsides, rock pits and recreation sites (see Section 2.4.3 – site types). Black bears are not targeting these areas for any particular reason but use incidentally for ease of travel.

Brown Bear

Brown bears (*Ursus arctos*) are important for both hunting (which includes guided and non-guided) recreation and the tourism industry of Southeast Alaska. Changes in road access and POG forest, especially along salmon-bearing streams, provide general measures of effects. Brown bears are habitat generalists, and will utilize everything from sea level to alpine. Within the project area, they are mostly located on the mainland, whereas black bears occupy the islands.

Red Squirrel

Red squirrels (*Tamiasciurus hudsonicus*) were selected as an MIS because they are an important prey species for marten and require forests with cone-producing trees and cavities in trees and snags. Changes in productive old-growth ("forests" site type) provide a general measure of effects. Weeds that occur in the "forests" site type may impact red squirrel habitat.

Red squirrels are year-round residents and common on both ranger districts.

River Otter

The river otter (*Lontra canadensis*) was selected as an MIS because of its association with coastal and freshwater aquatic environments. River otters from Southeast Alaska are morphologically distinct from those found in the Interior.

River otters are known to occur within the project area, especially within 100 feet of a shoreline where they are most active, within "wetlands", "streams and floodplains" and "forests" site types. Their biggest threat is from trapping, degradation or development of riparian habitat, and the reduction of water quality.

Sitka Black-tailed Deer

The Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) was selected as an MIS because it is an important game and subsistence resource in Southeast Alaska. It represents species that use lower elevation (below 800 feet) POG forest habitat during the winter, which equates to the "forests" site type. Changes in POG forest, especially below 800 feet in elevation, provides a general measure of effects.

Deer populations in Alaska are dynamic and fluctuate considerably with the severity of the winters and in response to wolf and bear predation. Current data reveals that deer populations are presently at moderate to low levels. The biggest threat to deer is the loss of productive old-growth habitat, second-growth stands entering stem exclusion, predation by wolves, black bear, and brown bear, increasing road densities, and illegal hunting. Deer are known to occur throughout the project area. Deer populations do not rely on any of the targeted weed species as a potential food source or for habitat.

Threatened, Endangered and Candidate Species

There are no known threatened or endangered species in the project area; however, there is one candidate species: yellow-billed loon.

Yellow-billed Loon (*Gavia adamsii*)

The yellow-billed loon was designated a candidate species throughout its range in March 2009 (USDI Fish and Wildlife Service 2009). Within the Forest Plan there are no specific management directions for yellow-billed loons but there is general direction for seabirds and shorebirds that apply to this species (USDA Forest Service 2008b, pp. 4-93 and 94).

Habitat for yellow-billed loons is usually associated with lakes and streams with low lying shorelines that are able to support abundant fish populations and dependable water levels (USDI Fish and Wildlife Service 2006). These habitats equate to "wetlands", "estuaries", and "streams and floodplains" site types. Yellow-billed loons nest exclusively in coastal and inland low-lying tundra 62-74° N latitude (USDI Fish and Wildlife Service 2006). Nest sites are usually located on islands, hummocks, peninsulas, or along low shorelines, within 3 feet of water and constructed of mud and peat (USDI Fish and Wildlife Service 2009). Yellow-billed loon migration routes are thought to be primarily marine. Specific characteristics of wintering habitats are not well known, but the species normally occurs in protected marine waters (USDI Fish and Wildlife Service 2006).

Yellow-billed loons are vulnerable due to a combination of low population size, low reproductive rate, and very specific breeding habitat requirements (USDI Fish and Wildlife Service 2006). There are conservation concerns for yellow-billed loons with their breeding range from gravel

extraction, road construction, proposed natural gas extraction, oil spills, subsistence harvest, climate-induced water level changes, fishing by-catch, and marine pollution.

There are no known nests for yellow-billed loons within the project area but there is potential habitat. The potential habitat is not currently impacted by weed infestations.

Sensitive Species

There are three sensitive species with habitat identified within the project area: black oystercatchers, Queen Charlotte Northern goshawk, and dusky Canada goose.

Black Oystercatchers (*Haematopus bachmani*)

The black oystercatcher have a small global population (8,500-11,000 individuals), which is regulated by the availability of quality foraging and nesting habitat. They are confined to a narrow coastal band of shoreline habitat which they depend on throughout their life cycle. Within the Forest Plan there are no specific management directions for black oystercatchers, but there is general direction for the protection of beach, estuary and riparian habitats that apply to this species (USDA Forest Service 2008b, pp. 4-93 to 94). These habitats equate to "wetlands", "estuaries" and "streams and floodplains" site types.

Black oystercatchers are a US Fish and Wildlife Service bird of conservation concern within Region 7 (Alaska), and are included in the Alaska Audubon Watch List because their reproductive rates are low.

Threats include predation, recreational disturbances, flooding, vessel wakes, and shoreline contamination (Tessler et al. 2010). The 1989 Exxon Valdez oil spill in Prince William Sound, Alaska, directly killed 20 percent of the population in the spill area and disrupted breeding activities (Gotthardt and Coray 2005). Gotthardt and Coray (2005) also identified concern that pressure from recreational activities in and around breeding areas could have deleterious effects. Human-induced disturbance is the most important limiting factor for population growth in some parts of the species range; human-induced habitat alteration is suspected of causing local extirpations from islands around Sitka, Alaska (Andres and Falxa 1995).

Habitat exists for the black oystercatcher within the project area, but there are no documented nesting sites. The nearest known nesting site is approximately 80 miles to the south on the Ketchikan Ranger District. If weeds spread to inter-tidal areas with sandy to rocky soils, they could impact black oystercatcher habitat.

Queen Charlotte Northern Goshawk (*Accipiter gentilis laingi*)

The Queen Charlotte goshawk is recognized as a distinct subspecies of the northern goshawk (*Accipiter gentilis*) which occurs only in coastal areas of British Columbia and in Southeast Alaska.

The Queen Charlotte goshawk was the subject of listing petitions and several other legal challenges under the Endangered Species Act (ESA). The Fish and Wildlife Service evaluated the best available information on biological vulnerability and threats to the Queen Charlotte northern goshawk and concluded that it does not support listing the subspecies populations in Alaska as threatened or endangered at this time (Federal Register 2007).

In Southeast Alaska, northern goshawks inhabit forested lands but favor dense stands of conifer or deciduous old-growth (the "forests" site type) for nesting and foraging habitat. Their diet is

dominated by a few key prey species including grouse, medium-sized birds such as Steller's jay, varied thrush, and red squirrels (USDA Forest Service 2008c). Nest trees are typically located in Sitka spruce or western hemlock and in mature to old-growth forest types. Productive old-growth forest is an important component of goshawk habitat and can be characterized as having older and/or larger trees with a dense canopy and a diverse understory. Non-productive forest types and young-growth stands are also used by goshawks for movement and foraging (USDA Forest Service 2008c). Occasionally, goshawks will nest and forage in younger forests or in smaller patches of trees, as well as along edges and in openings (Boyce et al. 2006). There are approximately 395 acres of documented weed infestations in the "forests" site type (see Table 3 in Section 2.4.3).

The Forest Plan provides Standards and Guidelines to maintain nesting habitat for goshawks. A no-activity buffer area of not less than 100 acres of productive old-growth, if it exists, is generally centered over the nest tree. Continuous disturbances that could lead to nest abandonment within the surrounding 600 feet of a nest are not permitted from March 15 to August 15 (USDA Forest Service 2008b, pp. 4-99 to 100). In Alaska, goshawks generally occur in low densities. The most recent estimates of the goshawk populations range from 261 to 336 breeding pairs on the Tongass National Forest and 300 to 400 pairs across Southeast Alaska (Federal Register 2007). Research specific to Southeast Alaska concluded that goshawks are uncommon in this region and nesting densities are lower than other areas (Federal Register 2007). The major threat to goshawks is the loss of old-growth habitat due to logging. Populations are believed to have declined, primarily due to timber harvest since the 1950s (Federal Register 2007). They have a low reproductive rate that makes recovery very slow.

According to ranger district data, northern goshawks have been found within existing territories across the project area.

Dusky Canada Goose (*Branta canadensis occidentalis*)

Dusky Canada geese compose one of the smallest populations of geese in North America. It is recognized as being unique to a small part of the Gulf of Alaska including the Copper River Delta and Prince William Sound. There is no specific Forest Plan direction for this species, but general direction for waterfowl and shorebird habitats apply (USDA Forest Service 2008b, pp. 4-93 to 94).

Breeding for the dusky Canada goose occurs on the Copper River Delta near Cordova, Alaska, and they winter in southwestern Washington and western Oregon (Eldrige et al. 1997). Primary foraging habitat includes tidal mud flats and adjacent areas ("wetlands" and "estuaries" site types) that include horsetails and sedges and other plant species (Bromley and Rothe 2003). Populations of dusky Canada geese in Alaska are experiencing decline and uncertainty. Productivity has declined primarily as a result of long-term changes to habitat and high rates of predation (Bromley and Rothe 2003). Although dusky Canada goose nest areas have not been identified on the Tongass, they may be observed along the Pacific coast while migrating to winter habitat (Bromley and Rothe 2003).

Primary concerns for the dusky goose are highly restricted areas of breeding, migration, stop-overs, and wintering areas across its range. The biggest threat is poor nesting success due to predation and loss of habitat outside of protected refuges within the wintering range and migration routes (Pacific Flyway Council 1997).

Desired Condition

The desired condition for the project area is elimination of non-native species while maintaining and in some cases improving habitat for native species. The project area has documented 89 weed species, covering approximately 517 acres. This is a relatively small amount of acreage when compared to the total project area, providing the Forest Service an opportunity to proactively treat weed species before they become firmly established.

3.8.3 Environmental Effects

Summary of Effects

A summary of effects to wildlife for each alternative considered are provided in Tables 30 and 31 below.

Table 30. Determination of effects by alternative for MIS individuals, habitat and forage.

Management indicator species	Determination		
	Alt 1 – No Action	Alt 2 – Proposed Action	Alt 3 – No herbicide
Alexander Archipelago wolf	Negligible	Negligible	Negligible
American marten	Negligible	Negligible	Negligible
Bald eagle	Negligible	Negligible	Negligible
Black bear	Negligible	Negligible	Negligible
Brown bear	Negligible	Negligible	Negligible
Red squirrel	Negligible	Negligible	Negligible
River otter	Negligible	Negligible	Negligible
Sitka black-tailed deer	Negligible	Negligible	Negligible

Table 31. Determination of effects by alternative for candidate and R10 sensitive wildlife species.

Species	Determination		
	Alt 1 – No Action	Alt 2 – Proposed Action	Alt 3 – No herbicide
Yellow-billed loon	No Impact	No impacts	Negligible
Black oystercatcher	No Impact	No impacts	Negligible
Queen Charlotte goshawk	No Impact	Negligible	Negligible
Dusky Canada goose	No Impact	No impacts	Negligible

Effects Common to All Action Alternatives

Early Detection-Rapid Response

Early detection-rapid response (EDRR) is an adaptive management tool included in this alternative to address ever-changing weed infestations, and allow ranger district staff to respond to the discovery of new or previously undiscovered infestations within the project area. It is assumed that undocumented infestations will show similar results to known, treated infestations within the same site type. The precise location or timing of the treatment may be unpredictable; however, project design features (PDFs) intended to minimize or eliminate adverse effects that could occur, and annual treatment caps, keep effects within those disclosed for the current inventory. Based on these assumptions, the use of EDRR would have negligible effects to the

habitat and forage for the MIS considered in this project; the designated critical habitat for the candidate specie present in the project area; and the population viability of sensitive species present in the project area.

Effects by Alternative

Both of the action alternatives have the potential to influence wildlife habitat, forage and populations as discussed below, but effects are expected to be minor since most weed infestations are less than 1 acre in size and the proposed treatments would be short-term and would not permanently displace any wildlife species. Also, there is no known use of target weed species by MIS, candidate or sensitive wildlife species for forage or habitat.

Alternative 1 – No Action

All wildlife species have been grouped together since the No Action Alternative would affect all species similarly.

Direct and Indirect Effects

Currently none of the MIS, the candidate specie or the sensitive species are measurably affected by any of the documented weed species.

If Alternative 1 is the selected alternative, the treatment program for the Petersburg and Wrangell Ranger Districts would continue in a similar manner as the past 5 years. This includes a continuation of weed treatments cleared in other NEPA documents (e.g., CEs for weed treatments at administrative and recreation sites). However, only those weed infestations currently being treated would continue to be treated (early detection-rapid response would not be implemented).

There could be future adverse effects if weed infestations are allowed to persist. Known infestations would likely increase in size and, without treatment, could reduce habitat and decrease forage for some species and adversely affect population numbers and viability.

Cumulative Effects

As a result of implementing the No Action Alternative, combined with past, present or reasonably foreseeable actions, there could be future adverse effects to wildlife population numbers and viability if weed infestations cannot be treated more extensively or opportunistically as proposed in the action alternatives.

Alternative 2 – Proposed Action

The effects of manual and mechanical treatments are discussed below in the effects to Alternative 3. This discussion only includes potential effects of herbicides on MIS, candidate and sensitive species.

The Forest Service contracts with Syracuse Environmental Research Associates, Inc. (SERA) to conduct the ecological risk assessments for herbicides that may be proposed for use on National Forest System lands. SERA risk assessments use peer-reviewed articles from the open scientific literature, current Environmental Protection Agency documents available to the public, and confidential business information to evaluate toxicity and risk from the herbicides analyzed. Specific methods used to prepare the SERA herbicide risk assessments follow standard risk assessment methodology and are described in SERA (2001). The determination of effects for wildlife relies on these risk assessments.

The effects from the use of herbicide depend on its toxic properties (hazards), and the level and duration of exposure. Exposure to wildlife can be reduced by site-specific application and appropriate treatment methods. For this project, spot and selective hand spraying that targets individuals and groups of plants is proposed. Broadcast spraying is not proposed.

Direct and Indirect Effects

While results of the herbicide risk assessments indicate that birds and mammals consuming vegetation (or insects) sprayed with herbicides have the most potential to receive doses above the toxicity index, and that direct spray of small mammals followed by consumption by predatory birds or mammals exceed the toxicity indices for some herbicides, these scenarios were determined unlikely for this proposal. Small mammals are generally nocturnal and spend daylight hours either in burrows or in trees and would unlikely be sprayed directly. In the case of predatory birds or mammals, the predator would have to consume an entire days diet worth of directly sprayed small mammals to receive a dose that exceeds the toxicity index. Consumption of contaminated fish did not exceed the toxicity index for any herbicide at any dose. Based on the review of the risk assessments, it is expected the proposed herbicides, applied at typical rates, would not pose a risk to MIS, candidate or sensitive individuals or their habitat.

Below are summaries of the possible effects of each herbicide proposed. For a more-complete discussion on all toxicological tests and endpoints considered, refer to the risk assessments for each proposed herbicide[22].

Summary of Effects of Herbicides on Wildlife

<u>Glyphosate</u>

SERA's risk assessment on glyphosate concludes that the effects of glyphosate to birds, mammals, fish and invertebrates are minimal based on a typical application rate of 2 lb a.e./acre (SERAa 2003, p. 4-43). At the maximum application rate considered, 7 lb a.e./acre, glyphosate has the potential to adversely affect large grass-eating mammals and insectivorous birds in chronic exposure scenarios, based on doses exceeding the NOAEL.

A chronic exposure scenario for a large grass eating mammal is the consumption of only contaminated grass for 90 days at the treatment site, assuming the highest residue rates. No adverse effects are plausible from acute exposures. The assumptions in the chronic exposure scenario are unlikely to occur in field conditions, particularly because glyphosate is a non-selective herbicide and would kill most forage species at this application rate, making the forage unavailable or unpalatable.

There are no data available on the persistence or degradation of glyphosate residue on insects; therefore, it is difficult to estimate potential acute or chronic effects to insectivorous birds. This analysis assumes a potential adverse effect since no chronic exposure scenario has been developed. All formulations and applications would follow manufacturer's specifications. Design features and application rate for glyphosate would be applied below its upper limit thus reducing the potential for impacts.

Drinking water: The acute no-observed-adverse-effect level (NOAEL) for mammals in laboratory toxicity tests is 175 mg/kg. The estimated doses to a small mammal from drinking water

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[22] Aminopyralid: http://www.fs.fed.us/foresthealth/pesticide/pdfs/062807_Aminopyralid.pdf
Glyphosate: http://www.fs.fed.us/r5/hfqlg/publications/herbicide_info/2003_glyphosate.pdf
Imazapyr: http://www.fs.fed.us/foresthealth/pesticide/pdfs/121804_Imazapyr.pdf

contaminated by an accidental spill, assuming the highest levels of contamination, are 5.32 mg/kg for acute exposure (SERAa 2003, Worksheet F05). If a small mammal consumes contaminated water over time, accounting for dissipation, degradation, and other processes, the animal would receive a chronic dose of 0.00234 mg/kg/day (SERAa 2003, Worksheet F07). Doses to a large mammal would be even lower on a per kg body weight basis. These doses are 0.03 of the acute NOAEL, and 0.00001 of the chronic NOAEL, respectively, therefore it is unlikely mammals would experience adverse effects from drinking contaminated water (SERAa 2003, p. 4-43).

Imazapyr

The typical application rate for imazapyr analysis in the risk assessment is the same as considered for this project (0.45 – 1.25 lb a.e./acre). Toxicity studies have not identified any potential hazards to terrestrial or aquatic animals. However, few wildlife species have been assayed relative to the large number of non-target animal species that might be exposed to imazapyr (SERA 2004). Imazapyr effects on birds are less extensive than those on mammals; no adverse effects have been noted. Application rates for this project are expected to be below 0.45 lb a.e./acre. All formulations and application would follow manufacturer's specifications. As such, all information indicates no adverse effect to wildlife due to the application of imazapyr.

Drinking water: The estimated dose to a small mammal from drinking water contaminated by an accidental spill of imazapyr, assuming the highest levels of contamination, is 1.22 mg/kg for acute exposure (SERA 2003b, Worksheet F05). If a small mammal consumes contaminated water over time, accounting for dissipation, degradation, and other processes, the animal would receive a chronic dose of 0.0000659 mg/kg/day (SERA 2003b, Worksheet F07). Doses to a large mammal would be even lower on a per kg body weight basis. These doses are 0.005 of the acute NOAEL, and 0.0000003 of the chronic NOAEL, respectively, therefore it is unlikely mammals would experience adverse effects from drinking contaminated water (SERA 2003b, p. 4-25).

Aminopyralid

Aminopyralid is a relatively new product, and it lacks the long history of laboratory and field studies available for many other commonly used herbicides. All of the information on the toxicity of aminopyralid available for use in the 2007b SERA risk assessment came from studies submitted to the U.S. EPA in support of aminopyralid registration.

Standard experimental toxicity studies in mammals indicate aminopyralid has low acute and chronic oral toxicity (SERA 2007b). Likely adverse effects in mammalian wildlife species are expected to be the same as those in experimental mammals receiving high doses (e.g., gastrointestinal changes, weight loss and short-term loss of coordination).

Results of laboratory testing indicate birds may be more sensitive to aminopyralid than mammals, experiencing adverse impacts lower at doses (SERA 2007b). The EPA, however, considers aminopyralid to have low toxicity by acute oral exposure to avian species.

There is no indication that mammals, birds, aquatic or terrestrial invertebrates, or amphibians would be adversely affected by aminopyralid at the exposure rates likely to occur under recommended application rates (0.078 – 0.11 lb a.e./acre) (SERA 2007b). The EPA also reports that "there are no acute or chronic risks to non-target endangered or non-endangered fish, birds, wild mammals, terrestrial and aquatic invertebrates, algae or aquatic plants" (US Environmental Protection Agency 2005, p.7). However, no field studies were available for incorporation into this risk assessment.

Drinking water: Based on its low toxicity, aminopyralid does not have an acute reference dose (RfD) established; therefore, an acute assessment is not needed for drinking water. A chronic exposure assessment considering the highest chronic concentrations from surface drinking water has shown levels of exposure which are four orders of magnitude below the RfD of 0.5 mg/kg-bw/day, both for adults and children 1-6 years of age (US Environmental Protection Agency 2005). Based on this information, it is unlikely mammals would experience adverse effects from drinking contaminated water due to an accidental spill.

Management Indicator Species (MIS), Candidate and Sensitive Species

<u>Alexander Archipelago Wolf</u>

Weed treatments would have *negligible effects* to Alexander Archipelago wolf individuals or their habitat because project activities would not alter suitable habitat, all disturbance would be short-term, and it is very unlikely they would be exposed to herbicide.

<u>American Marten</u>

The Proposed Action would have *negligible effects* to marten individuals or their habitat because project activities would not alter suitable habitat and is very unlikely their primary prey would be exposed to herbicide. According to the risk assessments, the proposed herbicide application rates would not exceed the toxicity indices.

<u>American Bald Eagle</u>

The Proposed Action would have *negligible effects* to bald eagle individuals and their habitat because project activities would not alter suitable habitat, it is very unlikely they would encounter vegetation that has been directly sprayed because no aerial application is proposed, and it is very unlikely their primary prey would be exposed to herbicide. The results of exposure scenarios indicate that no herbicides proposed in this project pose any plausible risk from birds eating contaminated fish. All expected doses to fish eating birds are well below no-observed-adverse-effect level (NOAEL) (Bautista 2008). An issue raised during public scoping was the possible contamination of eggs from the use of glyphosate; glyphosate studies found no risk of birth defects. Weed treatments would avoid active nest areas during the nesting season.

<u>American Black Bear and Brown Bear</u>

The Proposed Action would have *negligible effects* to black and brown bear individuals or their habitat because project activities would not alter suitable habitat, nor is it very likely that their prey would be reduced. In Southeast Alaska, fish is a major component of black and brown bears' diet and exposure scenarios for fish-eating birds indicate that no herbicide proposed pose any plausible risk to birds. The same is assumed for bears. For glyphosate, negative effects have been observed in rabbits when the application rate approaches the maximum limit (7 lb a.e./acre). All expected treatment application rates for glyphosate would be below the maximum limit. The probability of being directly sprayed or consuming exposed prey or grass is low because of the treatment design and the limited size of the infestations (most less than an acre).

<u>Red Squirrel</u>

The Proposed Action would have *negligible effects* to red squirrel individuals or their habitat because project activities would be short-term and not alter any suitable habitat (old-growth forest). Red squirrels are considered in this report because they are prey for other species analyzed in this report (e.g., bald eagle, bear and marten). The probability of red squirrels being

directly sprayed with herbicides is unlikely. Furthermore, according to the risk assessments, the proposed herbicide application rates would not exceed the toxicity indices.

River Otter

The Proposed Action would have *negligible effects* to river otter individuals or their habitat because project activities would be short-term and not alter any suitable habitat. The probability of individuals or their prey being directly sprayed is not likely. Exposure scenarios indicate that the proposed herbicides do not pose a risk to otters from eating contaminated fish. According to the risk assessments, the proposed herbicide application rates would not exceed the toxicity indices.

Sitka Black-tailed Deer

The Proposed Action would have *negligible effects* to Sitka black-tailed deer individuals or their habitat since spot spraying of target weeds is not likely to expose deer to harmful levels of herbicide or reduce foraging potential. Additionally project activities would not take place in deer summer habitat (alpine areas), and target weed species are not their preferred forage. Deer browsing habits do make it possible for individuals to consume vegetation sprayed with herbicide; however, in the unlikely event they were exposed to the proposed herbicides, none applied at typical application rates would result in a dose that exceeds toxicity indices in either acute or chronic scenarios.

Yellow-billed Loon

The Proposed Action would have *no impact* on yellow-billed loon individuals because there are no known nests within the project area and project activities would occur during the summer and fall when the candidate species are not typically present. The yellow-billed loon is only a winter resident, not a breeding resident. Furthermore, the scale of all weed treatments is extremely small when compared to the project area as a whole. The results of exposure scenarios indicate that the herbicides proposed in this project do not pose any plausible risk from birds eating contaminated fish or vegetation.

Black Oystercatcher

The Proposed Action would have *no impacts* on black oystercatcher individuals or their habitat because there are no known occurrences within the project area. In addition, black oystercatchers primarily eat marine invertebrates which would not be targeted through project activities. If black oystercatchers were to eat contaminated invertebrates, it is unlikely the dose of herbicide ingested would exceed toxicity indices.

Queen Charlotte Northern Goshawk

The Proposed Action would have *negligible effects* on northern goshawk individuals or their habitat because treatment would avoid known territories, would treat only a small percent of available habitat and herbicide effects are not likely. Northern goshawks exist in low densities across the project area. Weed inventories have identified approximately 75 acres of infestation within forested habitat where northern goshawks could occur. Weed treatments may disturb northern goshawks during the nesting season but any effects would be short-term. Project activities would avoid known territories during the breeding season, and if a new territory is discovered during implementation all activities would cease and the district biologist would be notified. None of herbicides proposed for this project applied at typical to high application rates pose a risk to northern goshawks or its prey.

Dusky Canada Goose

The Proposed Action would have *no impacts* on dusky Canada geese individuals or their habitat because they have not been documented nesting in the project area. The dusky goose is only a winter resident and is not known to breed on the Tongass National Forest. Project activities would occur during the summer and fall when dusky Canada geese are in the area. There is potential habitat but any impact associated with the Proposed Action would be immeasurable because the scale of treatment is extremely small and spread across a large project area. Estimates of risk using worst-case scenarios found negative effects when glyphosate was applied at its upper limit (7 lb a.e./acre) to large herbivore-eating birds, but none of the other herbicides proposed in this project, applied at typical application rates would result in a dose that exceeds toxicity indices in either acute or chronic scenarios. Design features and application rate for glyphosate would be applied below its upper limit thus reducing the potential for impacts. No broadcast spraying is proposed and spot spraying of weeds is not likely to expose geese to harmful levels of herbicide because the targeted weed species are not preferred forage.

Cumulative Effects

The impact to wildlife from multiple actions conducted at multiple sites over a period of years would be negligible. This consequence is attributed mainly to the limited projected area of treatments; minimal toxicity of herbicides to invertebrates and vertebrates; the annual 200-acre treatment limit (including EDRR); and the application of PDFs to minimize risk to wildlife individuals and habitat. Over the long-term, herbicide treatments would be beneficial to wildlife and their habitat due to the reduction of weed cover and spread within the project area.

Alternative 3 - Integrated Weed Management without Herbicide

This alternative would be the same as the Proposed Action (Alternative 2) without herbicides as a treatment option. All wildlife species have been grouped together since the alternative would affect all species in similar ways.

Direct and Indirect Effects

Hand and mechanical treatments can result in disturbance caused by human presence and loud noises generated by mechanical tools. However, most treatment sites are no larger than an acre in size and all hand and mechanical treatments would not last longer than a few days at a time. Since the proposed treatments in Alternative 3 would be short-term and would not permanently displace wildlife species, there would be negligible effects as a result of implementation. Project activities would avoid known goshawk and bald eagle territories during the nesting season, and if any of the candidate or sensitive species are discovered during implementation, the district wildlife biologist would be notified.

The implementation of Alternative 3 would not affect habitat of the wildlife discussed above because project activities only target weed species. And, currently, there is no known MIS or candidate and sensitive species use of target weed species for habitat or forage.

Without the use of herbicides, treatment of some weed species would likely be less effective and require more effort, entries and funds. Complete eradication of weed populations is unlikely and spread of many weeds would have similar effects to the No Action Alternative. This is especially true for species in which herbicide treatment is the most effective method of eradication. The inability to eradicate some weed species could potentially have a long-term adverse effect on native wildlife.

Cumulative Effects

The impact of combined actions conducted at multiple sites over a period of years would be minor. This is attributed primarily to the limited area where application of manual and mechanical methods (including EDRR infestations) would potentially increase human disturbance to wildlife. Level of impact of weed species would remain relatively constant since the area subject to treatment would not appreciably change, particularly with species best treated with herbicide. Future funding levels and personnel available to support treatment of the maximum 200-acre annual limit on the highest priority sites is currently unknown. As such, the area requiring treatment could eventually exceed available resources. In such a scenario weeds populations would expand, and wildlife forage and habitat conditions could be adversely affected following conversion from native plants to non-native weed species.

3.8.4 Design Features and Mitigation

Design features are intended to minimize the potential impacts of weed treatments on wildlife (see Section 2.5.2).

3.9 Subsistence

3.9.1 Introduction

Subsistence is a broad term applied to many natural resource uses by rural Alaskans. In the Alaska National Interest Lands Conservation Act (ANILCA), subsistence is defined (in part) as: "the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation" (ANILCA Section 803). The continuation of these uses "consistent with sound management principles, and the conservation of healthy populations of fish and wildlife" are provided for by ANILCA Section 802. The Act also states, in part, under Section 804 that "... the taking on public lands of fish and wildlife for non-wasteful subsistence uses shall be accorded priority over the taking on such lands of fish and wildlife for other purposes." For many rural Alaskans, subsistence is a way of life that embodies deep cultural and religious meaning.

ANILCA requires that federal agencies with jurisdiction over public lands in Alaska analyze subsistence resources and their uses and evaluate potential effects of management activities on these resources and uses (ANILCA Sec. 810). This analysis typically focuses on food-related resources that are most likely to be affected by habitat loss or alteration associated with land management activities. The analysis usually addresses three factors related to subsistence uses:

- Resource abundance and distribution
- Access to resources
- Competition for the use of resources

The evaluation determines whether subsistence uses in the project area are significantly restricted by any of the proposed project activities. The Alaska Land Use Council defines a significant restriction on subsistence uses as:

> A proposed action shall be considered to significantly restrict subsistence uses if, after any modification warranted by consideration of alternatives, conditions, or stipulations, it can be expected to result in a substantial reduction in the opportunity to continue uses of

renewable resources. Reductions in the opportunity to continue subsistence uses generally are caused by: reductions in abundance of, or major redistribution of resources; substantial interference with access; or major increases in the use of those resources by non-rural residents."

3.9.2 Affected Environment

Subsistence hunting, fishing, trapping, and gathering activities are a major focus of life for many Southeast Alaska residents; some individuals participate in subsistence activities to supplement personal income and provide needed food. Nearly all rural Alaska communities depend on subsistence resources to meet some portion of their nutritional needs (Wolfe 2000). Others pursue subsistence activities to perpetuate cultural customs and traditions. For all these individuals, subsistence is a lifestyle reflection deeply held attitudes, values, and beliefs.

Within the context of Southeast Alaska's seasonal and cyclical resource-based employment, subsistence harvest of fish and wildlife resources takes on special importance. The use of these resources may play a major role in supplementing cash incomes during periods when the opportunity to participate in the wage economy is either marginal or nonexistent. Because of high prices of commercial products provided through the retail sector of the cash economy, especially in remote communities, the economic role of locally available fish and game takes on added importance.

Existing Condition

Salmon and other finfish, shellfish, marine plants and mammals, wood, terrestrial wildlife including deer and other mammals, berries, and timber are all subsistence resources harvested by rural communities in Southeast Alaska.

Subsistence use areas and the levels of harvest are estimated using a variety of sources. Alaska Department of Fish and Game records the level of community harvests for selected wildlife species, such as deer, moose, black bear, wolf, and otter, within specific areas referred to as Wildlife Analysis Areas (WAAs). The project area contains 13 WAAs. The Alaska Department of Fish and Game harvest data and Tongass Resource Use Cooperative Survey (TRUCS) maps reveal subsistence use areas for deer, marine invertebrates, marine mammals, salmon and other fish within the project area.

Communities Using the Project Area

Kake

Kake is located on west Kupreanof Island, along Keku Strait, 38 air miles northwest of the former City of Petersburg. According to the 2010 census, there are 557 residents of Kake, with Alaska Natives comprising 69 percent of the total (ADLWD 2013).

In 1952, Kake became incorporated as a first class city[23]. The population of Kake, increased 56 percent between 1970-1990; this remained constant until 2000, with a decrease of approximately 153 people or 22 percent between 2000 and 2010. According to the Alaska Department of Labor in 2011, the total population of Kake was 579 residents.

[23] To be a first class city in Alaska, a community must have at least 400 permanent residents.

Salmon, finfish, and invertebrates account for 52 percent of the total edible pounds of subsistence resources harvested by Kake households (Kruse and Frazier 1998). Kake residents depend on the project area for subsistence resources.

City of Kupreanof

The City of Kupreanof, population 27, is within the Petersburg Borough but maintains its own city government (ADLWD 2013). This settlement is economically tied to Petersburg, where most residents find employment, purchase goods, and attend school (USDA Forest Service 2008c).

Petersburg Borough (formerly the City of Petersburg)

The 3,829-square-mile Petersburg Borough borders the City and Borough of Wrangell to the southeast and the Canadian province of British Columbia to the east. At its northwestern corner, it abuts the City and Borough of Juneau boundary, with Tracy Arm in between the two boroughs remaining unorganized. The borough was incorporated, and the city dissolved, by popular vote on January 3, 2013.

The population of Petersburg has increased by 57 percent between 1970 and 1990, increased by less than 1 percent between 1990 and 2000. The population decreased by 445 people or approximately 10 percent between 2000 and 2010. The current borough population is 3,273 permanent residents (http://www.ci.petersburg.ak.us/).

Salmon, other finfish and invertebrates account for 52 percent of the total edible pounds of subsistence resources harvested by Petersburg households (Kruse and Frazier 1988). Marine resources (fish and marine invertebrates) accounted for 65 percent of per capita subsistence harvest in Petersburg in 1987.

Petersburg residents typically harvest deer on Mitkof and Kupreanof islands, which are within the project area.

Wrangell City and Borough

Wrangell is located on the north end of Wrangell Island, near the mouth of the Stikine River, an historic trade route to the Canadian interior. According to the 2010 Census, the Wrangell Borough had a population of 2,369, with Alaska Natives comprising approximately 16 percent of the total (ADLWD 2013, http://live.laborstats.alaska.gov/cen/dp.cfm).

Wrangell is incorporated as a home rule municipality and has maintained its historic cultural diversity. In a move to emphasize the importance of subsistence, the Wrangell Indian Reorganization Act Council has formed its own local Fish and Game Advisory Committee (USDA Forest Service 2008c). Wrangell's population increased by 22 percent between 1970 and 1990, and then decreased by 171 residents or 7 percent between 1990 and 2000. The population decreased by an estimated 79 residents or 3 percent from 2000 to 2010. The total estimated population for Wrangell City and Borough is 2,448 (ADLWD 2013, http://laborstats.alaska.gov/pop/popest.htm).

Wrangell residents use the project area to harvest subsistence resources.

Desired Condition

- The Forest is managed to produce desired resources values, products, services, and conditions in ways that also sustain the diversity and productivity of ecosystems (USDA Forest Service 2008b, p.2-1).

- Provide for the continuation of subsistence uses and resources by all rural Alaska residents (USDA Forest Service 2008b, p. 2-7).
- In accordance with Title VIII of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA), it is the policy of the Forest Service that:
    - Consistent with the purposes for which National Forest System (NFS) lands in Alaska were established, sound management principles, and the conservation of healthy populations of fish and wildlife, the utilization of the NFS lands in Alaska is to cause the least adverse impact possible on rural residents who depend upon subsistence.
    - Provide for the continuation of the opportunity for subsistence uses by rural Alaskan residents, including both Natives and Non-Natives.
    - Cooperate with the State of Alaska, adjacent landowners, and land managers in managing subsistence activities and in maintaining the continued sustainability of all wild renewable resources on NFS lands.
    - Seek to maintain abundance and distribution of subsistence resources necessary to meet subsistence user needs (USDA Forest Service 2008b, pp. 4-68 to 4-69).

3.9.3 Environmental Effects

Section 810 of ANILCA requires the Forest Service, in determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of National Forest System land in Alaska, to evaluate the potential effects on subsistence uses and needs, followed by specific notice and determination procedures should there be a possibility of a significant restriction of subsistence uses. The Alaska Land Use Council's definition of "significantly restrict subsistence use" is one guideline used in evaluation:

> A proposed action shall be considered to significantly restrict subsistence uses, if after any modification warranted by consideration of alternatives, conditions, or stipulations, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources.

It should be noted that the term "significant" as used in this context does not have the same definition as used in the implementing regulation for NEPA. See 40 CFR Section 1508.27 for definitions of "significant" in a NEPA context.

Summary of Effects

The direct effects from the Wrangell and Petersburg Weed Management Project do not present a significant restriction of subsistence uses of deer, black bear, marten, wolf, otter, marine mammals, waterfowl, salmon, other finfish, marine invertebrates, fire wood, berries, and other foods.

The potential foreseeable and cumulative effects from implementing the no-action or the proposed action alternatives, do not present a significant possibility of a significant restriction to subsistence uses of black bear, marten, wolf, otter, marine mammals, waterfowl, salmon, other finfish, marine invertebrates, fire wood, berries and other foods.

Effects Common to all Action Alternatives

Hand and Mechanical Treatments

Hand and mechanical treatments can result in disturbance caused by human presence and loud noises generated by mechanical tools. Most treatment sites are less than an acre in size and all hand and mechanical treatments would not last longer than a few days at a time. All noises and disturbances caused by hand and mechanical treatment would be short-term and have no lasting effects to subsistence resources.

EDRR

Early detection-rapid response (EDRR) is an adaptive management tool included in this analysis to address ever-changing weed infestations, and allow ranger district staff to respond to the discovery of new or previously undiscovered infestations within the project area. Early detection and rapid containment of target weeds is the most efficient method for controlling their spread in terms of time and money. As a tool, the use of EDRR would produce negligible effects on subsistence resources.

Effects by Alternative

Alternative 1 – No Action

Direct and Indirect Effects

If Alternative 1 is the selected alternative, the treatment program for the Petersburg and Wrangell Ranger Districts would continue in a similar manner as the past 5 years. This includes a continuation of weed treatments cleared in other NEPA documents (e.g., CEs for weed treatments at administrative and recreation sites). However, only those weed infestations currently being treated would continue to be treated (early detection-rapid response would not be implemented).

In the short-term, there would be no direct or indirect effects to any subsistence resource (abundance and distribution, access, and competition). Weed infestations do not currently have a measurable impact on subsistence resources. However, weeds could have an impact in the future. It is important to be proactive and have the means to control weed species before they have an adverse impact to wildlife which is depended upon by rural Southeast Alaska residents for subsistence. Displacement of native plant communities by non-native weed species can result in alterations to ecosystem structure and function and ultimately create a loss of biodiversity at regional and global scales.

Alternative 2 – Proposed Action

Alternative 2 proposes to implement integrated weed management which is the same as Alternative 3, but with the use of herbicide. For effects associated with manual, mechanical and EDRR treatments, refer to the Effects Common to All Action Alternatives section. This section only discusses the use of herbicide.

The initial assessment and monitoring of each site would determine: the treatment method, potential use of herbicides, and the type of continued or follow-up treatments if needed. Acreage treated would average up to 200 acres per year, with a total of 2,000 acres treated over the life of the project (10 years). Herbicide treatments would be applied in accordance with label advisories, USDA Forest Service policies, and Forest Plan management direction. Specific design features

would be applied to minimize or eliminate the potential for weed treatments to adversely affect non-target plants, animals, human health, water quality, and aquatic organisms.

If herbicides are used, they would be applied using only ground-based methods (spot and selective hand spraying) based on accessibility, topography, and size of treatment areas. No aerial treatment is proposed.

Effects of Herbicides on Subsistence Resources

Glyphosate

The EPA has determined tolerances for glyphosate in or on animal commodities including milk and meat products. When applied appropriately, the EPA has concluded there is reasonable certainty that no harm will come to people who consume these products from aggregate exposure to glyphosate residues, including both dietary consumption of plant and animal products containing levels of glyphosate likely to occur if the chemical is correctly applied, as well as environmental exposure to the chemical in locations where it has been applied. Given that domestic animal commodities have been deemed safe for human consumption after exposure to glyphosate, it is expected that subsistence species are safe for consumption as well (SERAa 2003).

Imazapyr

Under normal circumstances and in most types of applications conducted as part of Forest Service programs, the consumption by humans of vegetation contaminated with imazapyr is unlikely. Nonetheless, any number of scenarios could be developed such as accidental spraying of edible wild vegetation (e.g., berries). In most cases the treated vegetation would probably show signs of damage from exposure to imazapyr, thereby reducing the likelihood of consumption. No effects at the highest doses tested (250 mg/kg for mammals and 674 mg/kg for birds) were observed for chronic or acute exposure (SERA 2004). See Section 3.1.3 for more on the effects of imazapyr on mammals.

Aminopyralid

Aminopyralid is not substantially metabolized in mammals and does not tend to accumulate in animal tissues. Instead, it is excreted, largely unchanged, from their systems shortly after consumption. The EPA has determined tolerances for aminopyralid in or on animal commodities including milk and meat from cattle, sheep, and goats (US Environmental Protection Agency 2005, pp. 5-6). When applied appropriately, the EPA has concluded there is reasonable certainty that no harm will come to people who consume these products from aggregate exposure to aminopyralid residues, including both dietary consumption, as well as environmental exposure to the chemical in locations where it has been applied (US Environmental Protection Agency 2005). Given that domestic animal commodities are deemed safe for human consumption after exposure to aminopyralid, subsistence species are also likely to be safe for human consumption.

Direct and Indirect Effects of Herbicides on the Three Factors Related to Subsistence Uses

Abundance and Distribution

Southeast Alaska subsistence resources include terrestrial wildlife (including deer, moose, mountain goat, black and brown bear, furbearers, and small game), waterfowl (including ducks, geese, and seabirds), marine mammals (harbor seal), salmon, other finfish, marine invertebrates, plants, and firewood.

There would be *negligible effects* to abundance and distribution of subsistence resources as a result of implementing the Proposed Action. The use of herbicides would not measurably affect abundance and distribution of any subsistence resource because the likelihood of any terrestrial or aquatic subsistence resource being directly sprayed or contaminated is very low. All expected application rates for the proposed herbicides are well below any known No Observable Adverse Effect Level (Bautista 2008). No dose of herbicide would exceed the toxicity indices. There is a possibility of affecting non-targeted adjacent plants but all impacts would be minor when compared to the abundance of available plant resources. This project is designed to minimize all potential impacts through treatment size, treatment type, application rate and intensity.

Access

Southeast Alaska is comprised of isolated islands unconnected by road systems; however, with the transportation means available (float plane, ferry system and boats), Southeast Alaska residents are very mobile in their subsistence resource use activities. Roads provide greater access to areas previously unconnected and can affect subsistence both positively and negatively by providing access, dispersing hunting and fishing pressure, and creating the potential for increased competition.

There are no proposed road access changes (road construction or closure); therefore, *negligible effects* to access of subsistence resources are expected. Roads are a primary vector for the spread of weeds and are one of the more heavily infested site types; however, herbicide treatment along road corridors would not affect subsistence access.

Competition

The Tongass National Forest, with nearly 17 million acres of largely undeveloped land, includes extensive subsistence resources. These resources are not distributed evenly across the Forest. Where the resources are confined to island groups or river systems and access is costly or non-existent, use of the resource is low. Where resources are abundant and access is available to local and other communities of Southeast Alaska, competition for resources may exist.

Under ANILCA, only rural Alaska residents qualify for subsistence hunting and fishing on federal lands. Alaska residents living in urban areas can harvest under sport, personal use, or commercial regulations, but not under subsistence. Following the Alaska Supreme Court's ruling in McDowell v. State of Alaska, all residents qualify as subsistence users on state lands, with federal lands continuing to be managed under ANILCA.

The implementation of Alternative 2 would have *negligible effects* on competition for any subsistence resource because abundance and access would not be affected. Competition may exist in some areas over resources but this alternative would not increase competition.

Alternative 3 – Integrated Weed Management without Herbicide

This alternative does not include herbicides as a weed treatment option. Only manual and mechanical methods are proposed.

Direct and Indirect Effects

There would be *negligible effects* to any subsistence resource as a result of implementing Alternative 3 because manual and mechanical treatments, in conjunction with EDRR, would create only a short-term disturbance. This disturbance is not expected to have a lasting impact to any subsistence resources.

3.9.4 Design Features and Mitigation

Design features are intended to minimize the potential impacts of weed treatments on project area resources (see Section 2.5.2). There are no design features specific to subsistence.

3.10 Recreation

3.10.1 Introduction

The effects discussed within this section relate to the restriction of recreation use, or experience due to the proposed treatment methods. The effects to the human health of recreationists are discussed in the Human Health section of this EA.

3.10.2 Affected Environment

Existing Condition

Weeds are found at many recreation sites in the project area (see Table 2). The most abundant weeds include common brassbuttons, reed canarygrass, white clover and creeping buttercup. Weeds most commonly invade areas where the natural vegetation has been disturbed or changed and there is little or no shade. These characteristics are often found at recreation sites like picnic areas, campsites, trailhead parking, and even cabins, but are especially common with recreation sites associated with roads. Recreation sites along roads generally have open areas with disturbed vegetation, making them more vulnerable to invasion by weeds. Some cabin sites that are only accessed by boat or float plane also have common weeds present like plantain and buttercup.

Three islands in the project area (Wrangell, Mitkof and Kupreanof) have National Forest System roads connecting to towns that are accessed by the Alaska Marine Highway System (AMHS) ferries. These ferries regularly transport vehicles and people to Wrangell, Petersburg and Kake. Independent visitors from outside the state and residents from other parts of Southeast Alaska use road systems that are accessible from the AMHS ferries or from local communities for recreational purposes. The road systems on Wrangell, Mitkof and Kupreanof islands access a number of recreation sites where people picnic, hike, camp and hunt.

Other islands and mainland areas include isolated road systems where vehicles are transported to them by barge and landing craft boats. These isolated road systems do not connect to any other roads or towns. Many of these places have Forest Service administrative sites with Forest Service vehicles staged at the sites as well. Roads in these locations receive lower levels of recreation use. However, recreation-related vehicle use has been growing on some remote islands, including Zarembo, Etolin, Kuiu and isolated road systems on Kupreanof. While the total amount of recreation use on these islands is low, it can be heavy at times, such as during hunting season (USDA Forest Service 2008c).

Recreation opportunities are described in this analysis using two concepts: Recreation Opportunity Spectrum (ROS) and recreation places.

Recreation Opportunity Spectrum (ROS)

The ROS provides a framework for defining outdoor recreation environments and the change in recreation setting as a result of development.

The ROS classifies recreation settings by their activities, remoteness, access, and experiences in a spectrum of classes from Primitive to Urban. The project area has all seven ROS classes:

Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Roaded Natural, Roaded Modified, Rural and Urban.

Of the known weed infestations in the project area, the Roaded Modified class has the highest acreage (314 acres). This ROS class has the most vectors for seed and plant parts movement. Also, the environment includes many areas of open, disturbed ground which favors weed invasion. The areas of known infestations outside Roaded Modified are usually associated with recreation sites. There is a large infestation of brassbuttons on the Petersburg District in the Semi-primitive Motorized class in Duncan Salt Chuck (104.6 acres). There are no roads in the area; the motorized classification comes from boat traffic.

Recreation Places and Sites

Recreation places are geographic areas that are used for recreation activities and are generally easy to access. These areas include a recreation attractor such as protected boat anchorages and landings, aircraft landing sites, a trail, a lake, a beach and roads (USDA Forest Service 2008c). Recreation sites are specific sites and/or facilities occurring within a recreation place. Some examples include: recreation cabins, campsites, shelters, trailheads, picnic areas and wildlife viewing areas.

Not surprisingly, weed species are often found at recreation places and sites because people and vehicles transport seeds and plant parts to those areas. A majority of the existing weed infestations are found along existing roads or adjacent to roads. A few exceptions are places accessible only by boat and floatplane including the Stikine River and its associated "flats" area, Duncan Canal, Anan Creek and Tebenkof Bay.

Both Wrangell and Petersburg Ranger Districts have a variety of public recreation cabins located in areas not accessible by road. Wrangell District has 22 cabins (1 subalpine, 4 lakeside, 5 Stikine River, 12 beach/estuary) and Petersburg has 18 cabins (2 alpine/subalpine, 4 lakeside (including 1 in alpine), 14 beach/estuary).

Currently, there are 20 recreation sites with documented weed infestations. These infestations range in size from less than 0.01 acre to 104.6 acres.

Past, Present, and Foreseeable Activities

Road construction, reconstruction and maintenance activities can all introduce weed species into new areas and spread them along existing roads. Likewise, construction, reconstruction, and maintenance activities at existing recreation sites and trails can also spread weed infestations. Two Resource Advisory Committee (RAC) projects proposed in the project area specifically concern weeds. One involves developing weed management plans for non-federal lands in and around Kake, and the Petersburg and Wrangell boroughs. The project is ongoing and has been contracted to the Alaska Association of Conservation Districts. The second project proposes invasive weed control (specifically reed canarygrass) in the Stikine-LeConte Wilderness area.

The past, present, and reasonably foreseeable projects evaluated for this analysis have been consolidated into a Catalog of Events, located in the project record.

3.10.3 Summary of Environmental Effects

ROS

There would be no direct, indirect, or cumulative effects to ROS classes in the project area from any alternative proposed in this project. The proposed activities would not affect the remoteness, access, activities, and experiences in a way that would change the recreation setting from one to class to another. In the No Action Alternative, increased weed infestations would affect the naturalness of a setting, but that alone would not be enough to change to another class on the spectrum.

Recreation Places and Sites

Direct and indirect effects from Alternatives 2 and 3 include eliminating or decreasing weeds in the places people recreate. This would increase the naturalness of the areas. Recreationists would likely notice manual and mechanical treatments as well as the dead plants from herbicides. These would be short-term effects. Some people may also need to temporarily recreate in other places during herbicide treatment. This would also be a very short-term effect that would be mitigated by following the project design features.

There would be no direct effects with the No Action Alternative, but there could be indirect effects. With limited weed management, weed populations could increase to the point that they are no longer practical or reasonable to treat. This has been seen in other areas of the US.

Beneficial effects would be greatest with Alternative 2 since there are more options for weed control. The most effective and efficient method for each species at each site could be used and the natural vegetation at the recreation places would not be as vulnerable to weed infestations.

3.10.4 Design Features and Mitigation

Design features are intended to minimize the potential impacts of weed treatments on recreation sites and its users (see Section 2.5.2).

3.11 Roadless

3.11.1 Introduction

When projects are proposed in inventoried roadless areas (IRAs), the main issue addressed is the effect on roadless characteristics. These effects are considered and potential changes are described. Cumulative impacts are considered on the biological, physical and social values of the IRAs.

3.11.2 Affected Environment

Existing Condition

IRAs are defined as undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for Wilderness consideration under the Wilderness Act and were inventoried during the Forest Service's Roadless Area Review and Evaluation (RARE II) process and during subsequent updates and forest planning analyses. Currently there are approximately 9.3 million acres in IRAs on the Tongass (USDA Forest Service 2001c).

Roadless areas represent an inventory of the condition of the land, not a management prescription or LUD. There is no management direction or Standards and Guidelines that specifically apply to IRAs. Management of these and all other areas on the Tongass is directed by the Standards and Guidelines of the LUD(s) in which the affected area falls (USDA Forest Service 2008b).

There are 48 IRAs located within the project area, which total approximately 2.9 million acres. Nine of the IRAs have known weed infestations (35 acres or less than 0.001 percent of the total IRA acreage). Most infestations are small and scattered. Table 32 shows the total number of acres associated with 2001 roadless inventory for the project area.

Table 32. Acres of inventoried roadless area in the project area by ranger district

Ranger district	Total IRA acres	Total acres of infestation
Petersburg	1,506,048	7
Wrangell	1,470,926	28
Total project area	**2, 976,974**	**35**

All project area IRAs represent the typical qualities of many IRAs in Southeast Alaska. These descriptions are used to describe the existing condition and help facilitate an understanding of the potential change to the roadless characteristics (i.e., values or features that make the area appropriate and valuable for Wilderness) that would occur as a result of the implementation of this project (Table 33).

Roadless characteristics are described fully in the November 2000 Forest Service Roadless Area Conservation FEIS (USDA Forest Service 2000, pp. 3-3 to 3-7).

Table 33. List of roadless characteristics and where they are discussed within this chapter of the EA.

2000 Roadless characteristics[1]	Sections where roadless characteristics are discussed in this chapter
Biological Values	
Diversity of plant and animal communities	Sensitive and Rare Plants (3.3), Aquatic Organisms (3.6), Wildlife (3.8)
Habitat for threatened, endangered, proposed, candidate and sensitive species, and for those species dependent on large, undisturbed areas of land	Sensitive and Rare Plants (3.3), Aquatic Organisms (3.6), Wildlife (3.8)
Physical Values	
High quality or undisturbed soil, water and air	Soils and Wetlands (3.4), Hydrology (3.5)
Sources of public drinking water	Hydrology (3.5)
Social Values	
Primitive, Semi-primitive Non-motorized, and Semi-primitive motorized classes of dispersed recreation opportunities	Recreation (3.10)
Reference landscapes	Wilderness (3.7)
Natural appearing landscapes with high scenic quality	Wilderness (3.7)
Traditional cultural properties and sacred sites	Cultural Resources (3.12)
Other locally identified unique characteristics	Subsistence (3.9)

[1] From the Forest Service Roadless Area Conservation FEIS, Volume 2 (USDA 2000).

Methodology

This project-level analysis does not evaluate roadless areas for Wilderness recommendation. However, roadless characteristics are used to evaluate and describe the potential changes to these characteristics by alternative and are discussed in more detail in the individual resource analysis sections (see Table 33).

This analysis focuses on the potential direct and indirect change to roadless characteristics due to implementation of this project, and the cumulative impacts to the biological, physical or social values of the IRAs.

3.11.3 Summary of Environmental Effects

Spatial and Temporal Context for Effects Analysis

The analysis area for direct, indirect and cumulative effects to IRAs is the project area. Short-term and temporary effects are considered to be one year or less. Long-term effects would continue past one year and up to ten years.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

The actions considered in the cumulative effects analysis include: timber harvest, pre-commercial thinning, road building, restoration, and recreation improvements, among others. The level of cumulative effects that may occur in the future will depend on the rate at which new projects are implemented and the rate at which disturbances from past and present activities recover. The rate at which many new projects are implemented is heavily dependent on future levels of available funding.

The projects considered in the cumulative effects analysis have been consolidated in the Catalog of Events located in the project record.

Summary of Effects

When considering the potential change to the roadless characteristics of the IRAs, implementation of any alternative would have little effect in the short-term. In the long-term, implementation of the No Action Alternative could have the greatest effect as it could lead to decreased functioning of resources due to the spread and establishment of weeds.

The treatments proposed by both action alternatives would have no cumulative effect on IRAs; would offset the negative impacts of growing weed populations; and would more-effectively prevent the establishment of new populations. Individually identified roadless characteristics would either remain unchanged or be minimally influenced by the proposed activities. The early detection-rapid response (EDRR) strategy would have a positive impact on roadless characteristics because it enables early treatment of new infestations before they impact natural processes, and requires less impact (entries required to eradicate, contain or control the infestation, amount of herbicide used, or amount of disturbance due to manual and mechanical methods) during treatment.

The allowable use of herbicides in Alternative 2 would provide a more-efficient and effective means of weed control and therefore have a greater beneficial effect on roadless characteristics than Alternative 3.

3.11.4 Design Features and Mitigation

During project implementation, site-specific design features would be applied (see Section 2.4).

3.11.5 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Management activities on National Forest System (NFS) lands are required to comply with the Tongass Land and Resource Management Plan (Forest Plan) and federal and state laws. Relevant standards and regulations intended to protect roadless resources are summarized below.

- Tongass Land and Resource Management Plan – The Forest Plan is the governing document for management activities that take place within the Tongass National Forest (USDA Forest Service 2008b). It consists of three parts that work together to facilitate the development of management activities. These parts include: Forest goals and desired conditions for resources; the management prescriptions for each of the 19 land use designations (LUDs); and the Forest-wide Standards and Guidelines, which apply to all or most areas of the Forest and provide for the protection and management of Forest resources.

- Roadless Area Conservation Final Rule (36 CFR Part 294) – The Roadless Area Conservation Final Rule establishes prohibitions on road construction, road reconstruction and timber harvesting in IRAs on National Forest System lands.

3.12 Cultural Resources

The Forest Service program for compliance with the National Historic Preservation Act (NHPA) includes locating, inventorying and evaluating the National Register of Historic Places eligibility of historic and archeological sites that may be directly or indirectly affected by scheduled activities.

The proposed plant eradication treatments, including hand pulling, mowing, tarping and herbicide application, have little potential to cause effects to historic properties. The Alaska Region Preservation Act categorizes noxious weed and invasive plant eradication as an undertaking that has no potential to affect historic properties.

The Tongass National Forest has determined that a finding of No Historic Properties Affected is appropriate for this project. Obligations using modified procedures of the 36 CFR 800 review process as defined in the Programmatic Agreement have been met.

A complete report on the effects of the proposed actions on cultural resources is located in the project record at the Petersburg Ranger District office.

3.13 Other Laws and Regulations

Several of the laws and executive orders listed in Chapter 1 (Section 1.8) require project specific findings or disclosures. These will be included in the Decision Notice and apply to all alternatives considered in this EA.

Chapter 4. References and Lists

4.1 List of Preparers

The following is a list of the interdisciplinary team members who participated in completing this environmental analysis.

Carey Case, Interdisciplinary Team Leader

Heath Whitacre, Hydrologist

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4.2 Glossary

Acute exposure – a single exposure of multiple brief exposures occurring within a short time (e.g., 24 hours of less in humans)

Acute toxicity – any harmful effect produced in an organism through an acute exposure to one or more chemicals.

a.e. – acid equivalent

Adjuvants – compounds added to an herbicide formulation to improve its performance. They can either enhance the activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with its application (special purpose or utility modifiers).

Allelopathy – the inhibitory or stimulatory effects of released organic chemicals by one plant on the germination, growth, or metabolism of a different plant (Helms 1998).

Cation exchange capacity - the sum total of exchangeable cations that a soil can adsorb, expressed in milliequivalents per 100 grams of soil (Brady 1974).

Chronic exposure – exposures that occur over the average lifetime or for a significant fraction of the lifetime of a species. Chronic exposure studies evaluate the carcinogenic potential of chemicals and other long-term health effects.

Control – eradicating, suppressing, reducing, or managing weed populations, preventing spread of weeds from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of weeds and to prevent further invasions (USDA Forest Service 2007).

Herbicide – a pesticide used to kill unwanted plants.

Introduction – the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity (USDA Forest Service 2007).

Invasive plant – an alien plant whose introduction does or is likely to cause economic or environmental harm or harm to human health (adapted from Executive Order 13112, which defines invasive species) (USDA Forest Service 2007).

LC50/EC50 – lethal concentration 50/environmental concentration 50 - a calculated concentration of a chemical in air or water to which exposure for a specific length of time is expected to cause death in 50 percent of a defined experimental animal or plant population.

NOEL or NOEC – no observed effect level/concentration: exposure level at which there are no statistically or biological significant differences in the frequency or severity of adverse effects between the exposed populations and its appropriate control.

Native species – with respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.

Non-native plant species – a species living outside its native distributional range, which has arrived there by human activity, either deliberate or accidental.

Noxious weed – those plant species designated as noxious weeds by federal or state law. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and generally non-native (USDA Forest Service 2007).

Pesticide – any substance or mixture of substances, including plant regulators, defoliants, desiccants and spray adjuvants, intended to prevent, destroy, control, repel, or mitigate any insect, rodent, snail, slug, fungus, weed, and any other form of plant or animal or virus, except viruses on or in a living person or other animal (http://agr.wa.gov/pestfert/definitions/pesticide.aspx).

Project area – the Wrangell and Petersburg Ranger Districts of the Tongass National Forest

Site type – represent where most known infestations occur, and are typically high-use areas where future infestations are expected (i.e., along roadsides, recreation areas, rock pits, etc.) and are likely locations for vectors to pick up seeds or propagules for transport to other high-use areas.

Pathways of spread – *see Vectors*

Toxicity index – the benchmark dose used in this analysis to determine a potential adverse effect when it is exceeded. Usually a NOEL, but when data are lacking other values may be used. For example a value equal to 1/20th of the known LC50 may be used as a toxicity index.

Vectors - are pathways of spread. Common vectors for weeds are water, wind, people, animals and vehicles.

Weed – collective term used in this document for invasive and non-native plants.

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Appendix A. Weed Infestations in the Project Area

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Appendix A

Table A1 provides a comprehensive list of the documented weed infestations in the project area. The infestations are presented by Ranger District, HUC (Treatment Area ID) and site type. Acres of potential treatment are also provided. Scientific and common plant names for the plant codes listed in Table A1 are provided in Table A2. Table A2 also indicates which weeds are target species. Target species are those of greatest concern and are the focus of the Wrangell-Petersburg Weed Management EA. Target weed species have been determined to pose a threat to the ecological integrity or desired condition of the sites they occupy. Possible treatment methods for target species are outlined in Chapter 2, Table 8.

Table A1. Documented weed infestations in the project area.

District	Treatment Area ID	Treatment Area Acres	Site Type	Weed Species Currently Detected
WRD	190102090201-Helen Peak	32	*Stream*	PHAR3
		32	*Roadside*	PHAR3
		31.878	*Stream Crossing*	PHAR3
WRD	190102090301	18.31	*Stream*	HIMU, PHAR3, PLMA2, TRHY
		20.6278	*Roadside*	HIAU, HIMU, PHAR3, PLMA2, HYRA3, TRHY, TRRE3
		15.3817	*Rock Pit*	HIMU
		17.76	*Stream Crossing*	HIMU, PHAR3
PRD	190102100101-Big Creek	0.5402	*Stream*	PHAR3, PLMA2, RARE3, TRRE3
		8.5043	*Roadside*	HIAU, LEVU, PHAR3, PLMA2, RARE3, TRHY, TRPR2, TRRE3
		1.5121	*Rock Pit*	PHAR3, PLMA2, RARE3, TRRE3
PRD	190102100502	1.6004	*Roadside*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3
		0.2	*Stream Crossing*	PHAR3, PLMA2
PRD	190102101103	0.1319	*Stream*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3
		1.2151	*Roadside*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3
		0.1	*Rock Pit*	PHAR3, PLMA2,TRHY,TRRE3
		0.0006	*Stream Crossing*	TRHY
PRD	190102101201-Sumner Mountains	0.7043	*Stream*	PHAR3, PLMA2, TAOF, TRRE3
		2.8581	*Roadside*	HIAU, HYRA3, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		0.3	*Rock Pits*	PHAR3, PLMA2, TAOF, TRHY
		0.2481	*Stream Crossing*	PHAR3, PLMA2, TAOF, TRRE3
WRD	Anan Creek	4.5833	*Stream*	PHAR3
		4.5833	*Rec Site*	PHAR3
		4.5833	*Trail*	PHAR3
WRD	Andrew Creek	0.203	*Stream*	PHAR3,PLMA2,RARE3,TAOF

District	Treatment Area ID	Treatment Area Acres	Site Type	Weed Species Currently Detected
WRD	Anita Bay-Frontal Zimovia Strait	2.5	*Stream*	PHAR3
WRD	Anita Bay-Frontal Zimovia Strait	34.4	*Roadside*	PHAR3,TRHY,TRRE3
WRD	Anita Bay-Frontal Zimovia Strait	31.8775	*MAF*	PHAR3
WRD	Anita Bay-Frontal Zimovia Strait	2	*Stream Crossing*	PHAR3
WRD	Baht Harbor-Frontal Sumner Strait	11.6099	*Stream*	HIMU,PHAR3,RARE3
WRD	Baht Harbor-Frontal Sumner Strait	20.1195	*Roadside*	HIMU,LEVU,PHAR3, RARE3
WRD	Baht Harbor-Frontal Sumner Strait	2.8	*Rock Pit*	HIMU,PHAR3,RARE3
WRD	Baht Harbor-Frontal Sumner Strait	11.8214	*Stream Crossing*	HIMU,PHAR3,RARE3
PRD	Big Creek	0.1837	*Stream*	PHAR3,PLMA2,TRRE3
PRD	Big Creek	0.2844	*Roadside*	PHAR3,PLMA2,TRRE3
PRD	Big John Bay-Frontal Rocky Pass	1.0184	*Stream*	LEVU,PHAR3,PLMA2, RARE3,TAOF,TRHY, TRRE3
PRD	Big John Bay-Frontal Rocky Pass	11.5576	*Roadside*	CESTM, HYRA3, LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRPR2, TRRE3
PRD	Big John Bay-Frontal Rocky Pass	0.4407	*Rock Pit*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3
PRD	Big John Bay-Frontal Rocky Pass	0.5167	*Stream Crossing*	HYRA3, LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3
PRD	Big John Creek	0.0005	*Stream*	TRHY
PRD	Big John Creek	2.1268	*Roadside*	HYRA3, PHAR3, PLMA2, TAOF, TRHY, TRPR2, TRRE3
PRD	Big John Creek	0.1529	*Rock Pit*	PHAR3, TAOF, TRHY
PRD	Big John Creek	0.1728	*Stream Crossing*	PHAR3, TRRE3
PRD	Blind River	1.3206	*Stream*	CRTE3, HIAU, LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
PRD	Blind River	1.2558	*Estuary*	HIAU, LEVU, PHAR3 PLMA2, RARE3, TAOF, TRRE3
PRD	Blind River	2.0656	*Rec-Site*	HIAU, LEVU, PHAR3 PLMA2, RARE3, TAOF, TRHY, TRPR2 TRRE3
PRD	Blind River	16.9664	*Roadside*	CRTE3, HIAU, HICA10, HYPE, LEVU, PHAR3, PLMA2, RARE3, TAVU, TAOF, TRHY, TRPR2, TRRE3
PRD	Blind River	0.7	*Stream Crossing*	PHAR3, PLMA2, RARE3, TAOF, TRRE3
PRD	Bohemian Range-Frontal Frederick Sound	0.001	*Stream*	PHAR3
PRD	Bohemian Range-Frontal Frederick Sound	0.0116	*Roadside*	PHAR3, TRHY, TRRE3

District	Treatment Area ID	Treatment Area Acres	Site Type	Weed Species Currently Detected
PRD	Cathedral Falls Creek	0.6505	*Stream*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRRE3
		5.9266	*Roadside*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRPR2, TRRE3
		0.6053	*Rock Pits*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3
		0.0738	*Trail*	PHAR3, PLMA2, TAOF. TRRE3
		0.1	*Stream Crossing*	PHAR3
WRD	Chichagof Pass-Frontal Stikine Strait	6.7267	*Stream*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		7.4422	*Roadside*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		6.4946	*Stream Crossing*	PHAR3, TAOF
PRD	Chipp Peak-Frontal Frederick Sound	0.11	*Stream*	PHAR3
		1.7715	*Roadside*	PHAR3, TRRE3
		0.367	*Rock Pit*	PHAR3, TRRE3
		0.0995	*Stream Crossing*	PHAR3
PRD	Colorado Creek-Frontal Wrangell Narrows	1.1426	*Stream*	HIAU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRPR2, TRRE3
		0.15	*Rec Site*	PHAR3, PLMA2, TAOF, TRRE3
		8.3166	*Roadside*	DIPU, HIAU, LEVU, PHAR3, PLMA2, POCU6, RARE3, TAOF, TRHY, TRPR2, TRRE3
		1.2	*Rock Pit*	DIPU, HIAU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		0.13	*Stream Crossing*	PHAR3, PLMA2, TAOF, TRRE3
PRD	Dean Creek-Frontal Frederick Sound	3.97	*Stream*	CIVU
		3.97	*Roadside*	CIVU
		3.97	*Stream Crossing*	CIVU
WRD	Earl West Creek	0.0535	*Stream*	PHAR3, PLMA2, RARE3, TRHY, TRPR2
		1.7128	*Roadside*	HICA10, PHAR3, PLMA2, RARE3, TRHY, TRPR2, TRRE3
		0.699	*Rock Pit*	PHAR3
		0.0744	*Stream Crossing*	PHAR3
PRD	Falls Creek	1.4196	*Stream*	PHAR3, PLMA2, RARE3, TAOF, TRRE3
		10.4608	*Roadside*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRPR2, TRRE3
		1.3641	*Rock Pit*	PHAR3, PLMA2, RARE3, TAOF, TRHY,TRRE3
		0.0495	*Stream Crossing*	PHAR3

District	Treatment Area ID	Treatment Area Acres	Site Type	Weed Species Currently Detected
WRD	Fools Inlet-Frontal Ernest Sound	0.51	*Stream*	PHAR3, PLMA2, TRHY, TRRE3
		0.0101	*Rec Site*	PHAR3, TRHY
		5.648	*Roadside*	CIVU, HYRA3, LOCO6, PHAR3, PLMA2, RARE3, TAVU, TAOF, TRHY, TRPR2, TRRE3
		0.7776	*Rock Pit*	PHAR3, PLMA2, TAOF, TRHY, TRPR2, TRRE3
		0.07	*Stream Crossing*	PHAR3
PRD	Goose Cove	2.0386	*Stream*	LEVU, PHAR3, PLMA2, TRHY, TRRE3
		8.2501	*Roadside*	HYRA3, LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRPR2, TRRE3
		0.3992	*Rock Pit*	PHAR3, PLMA2, TRHY, TRRE3
		0.1	*Stream Crossing*	PHAR3
PRD	Hamilton Bay-Frontal Keku Strait	0.2742	*Stream*	PHAR3, PLMA2, RARE3, TAOF, TRRE3
		5.9327	*Roadside*	LEVU, PHAR3, PLMA2, RAAC3, RARE3, TAOF, TRHY, TRPR2, TRRE3
		0.28	*Rock Pit*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRRE3
		0.27	*Stream Crossing*	PHAR3, PLMA2, RARE3, TRRE3
		0.06	*MAF*	PHAR3, TRHY
PRD	Headwaters Castle River	0.4231	*Roadside*	PHAR3, PLMA2, TRHY
		0.0843	*Rock Pit*	PHAR3, PLMA2, TRHY
		0.01	*Stream Crossing*	TRHY
PRD	Headwaters Hamilton Creek	0.6357	*Roadside*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3
		0.152	*Rock Pit*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3
PRD	Irish Creek	0.08	*Stream*	PHAR3, TRHY
		0.6061	*Roadside*	PHAR3, TRHY, TRPR2, TRRE3
PRD	Keku Strait-Frontal Frederick Sound	0.4657	*Stream*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		0.7917	*Roadside*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRPR2, TRRE3
WRD	Ketili Creek	0.0302	*Stream*	PHAR3
WRD	Ketili River-Stikine River	0.9595	*Stream*	MEOF, PHAR3, RARE3, TAOF
		0.0163	*Trail*	RARE3, TAOF
WRD	Kikahe River	0.4591	*Stream*	PHAR3
		0.0219	*Rec Site*	PLMA2, TAOF

District	Treatment Area ID	Treatment Area Acres	Site Type	Weed Species Currently Detected
PRD	Mitkof Island-Frontal Frederick Sound	0.199	*Stream*	PHAR3
		2.2518	*Roadside*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		0.3073	*Rock Pit*	PHAR3, PLMA2, RARE3, TRHY, TRRE3
WRD	Mosman Inlet-Frontal Rocky Bay	0.0099	*Stream*	PHAR3
		0.89	*Roadside*	HYRA3, LOCO6, PHAR3
PRD	North Arm Duncan Canal-Frontal Duncan Canal	104.5233948	*Stream*	COCO7, PHAR3, TRHY, TRRE3
		104.4737948	*Estuary*	COCO7
		104.4737948	*Rec Site*	COCO7
		2.0506	*Roadside*	LEVU, PHAR3, PLMA2, RARE3, SOAU, TAOF, TRHY, TRPR2, TRRE3
		0.1038	*Rock Pit*	LEVU, PHAR3, PLMA2, TRHY, TRPR2, TRRE3
		0.0011	*Stream Crossing*	PHAR3, TRHY
PRD	North Arm-Frontal Frederick Sound	1.7774	*Stream*	PHAR3, PLMA2, POCU6, RARE3, TRHY, TRRE3
		0.0356	*Estuary*	PHAR3, SOAU
		4.2627	*Roadside*	HIAU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		0.526	*Rock Pit*	HIAU, PHAR3, PLMA2, TRHY, TAOF, TRRE3
		0.1	*Stream Crossing*	PHAR3
PRD	Ohmer Creek-Frontal Blind Slough	3.1438	*Stream*	HIAU, PHAR3, PLMA2, RARE3, TAOF, TRRE3
		1.3306	*Estuary*	HIAU, PHAR3, PLMA2, RARE3, TAOF, TRRE3
		0.8524	*Rec Site*	HIAU, PHAR3, PLMA2, RARE3, TAOF, TRRE3
		13.3796	*Roadside*	DIPU, HIAU, HYRA3, LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		0.5573	*Rock Pit*	PHAR3, PLMA2, RARE3, TAOF, TRRE3
		0.498	*Stream Crossing*	HIAU, PHAR3, PLMA2, RARE3, TAOF, TRRE3
PRD	Outlet Hamilton Creek	1.3607	*Stream*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3
		12.6849	*Roadside*	HYRA3, LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRPR2, TRRE3
		1.0596	*Rock Pit*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRPR2, TRRE3
		0.7825	*Stream Crossing*	LEVU, PHAR3, PLMA2, TAOF, TRHY, TRRE3

District	Treatment Area ID	Treatment Area Acres	Site Type	Weed Species Currently Detected
WRD	Pat Creek-Frontal Zimovia Strait	3.3399	*Stream*	HYRA3, LEVU, PHAR3, PLMA2, RARE3, TRHY, TRPR2, TRRE3
		0.0841	*Rec Site*	TRHY, TRPR2, TRRE3
		7.3924	*Roadside*	HIAU, HYRA3, LEVU, PHAR3, PLMA2, LOCU6, RARE3, TAOF, TRHY, TRPR2, TRRE3
		1.2593	*Rock Pit*	HIAU, HIMU, LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		0.7892	*Stream Crossing*	HIMU, PHAR3, TRRE3
PRD	Petersburg Creek	0.51	*Stream*	DIPU, PLMA2, RARE3
		0.52	*Rec Site*	PHAR3, PLMA2, RARE3, TAOF
		0.5	*Trail*	RARE3
PRD	Portage Bay-Frontal Frederick Sound	2.0287	*Stream*	LEVU, PHAR3, PLMA2, RARE3, TAVU, TAOF, TRHY, TRRE3
		11.4834	*Roadside*	LEVU, PHAR3, PLMA2, RARE3, TAVU, TAOF, TRHY, TRRE3
		0.665	*Rock Pit*	PHAR3, PLMA2, RARE3, TRRE3
		1.1947	*Stream Crossing*	LEVU, PHAR3, PLMA2, RARE3, TAVU, TAOF, TRRE3
WRD	Saint John Harbor	3.7	*Stream*	PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		4.1854	*Roadside*	HIAU, HIMU, HYRA3, LEVU, LOCO6, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		3.0405	*Stream Crossing*	PHAR3
WRD	Salamander Creek	0.5807	*Stream*	PHAR3, RARE3, TRHY, TRRE3
		0.07	*Rec Site*	PHARE3, TRHY
		7.0398	*Roadside*	HIMU, HYRA3, LEVU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRPR2, TRRE3
		0.3832	*Rock Pit*	PHAR3, PLMA2, TRHY, TRRE3
WRG	Shakes Slough	0.0062	*Stream*	TAOF
PRD	Sitkum Creek	0.6459	*Roadside*	LEVU, PHAR3, PLMA2, RARE3, TAOF, TRRE3
WRD	Snow Passage-Frontal Clarence Strait	0.36	*Stream*	PHAR3
		0.6761	*Roadside*	HIMU, LEVU, PHAR3, PLMA2, TAOF, TRHY, TRPR2, TRRE3
		0.0225	*Rock Pit*	HIMU, PHAR3, PLMA2, TRRE3
		0.36	*Stream Crossing*	PHAR3
WRD	Stikine River-Frontal Stikine Strait	19.9844	*Stream*	HIAU, HIMU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
		0.0993	*Estuary*	TAOF
		2.0492	*Rec Site*	PHAR3, RARE3, TAOF

District	Treatment Area ID	Treatment Area Acres	Site Type	Weed Species Currently Detected
WRD	Thoms Creek	0.23	*Stream*	HIAU, PHAR3, TRHY, TRRE3
		2.9664	*Roadside*	HIAU, LEVU, PHAR3, PLMA2, TAOF, TRHY, TRPR2, TRRE3
		0.33	*Rock Pit*	PHAR3, TRHY, TRRE3
		0.06	*Stream Crossing*	HIUA, PHAR3
PRD	Towers Arm-Frontal Duncan Canal	0.133424809	*Stream*	COCO7
		0.133424809	*Estuary*	COCO7
		0.133424809	*Rec Site*	COCO7
PRD	Tunehean Creek	0.0006	*Stream*	TRHY
		0.0211	*Roadside*	PHAR3, TRHY
PRD	Twelvemile Creek	0.1	*Stream*	PHAR3
PRD	Woodpecker Cove-Frontal Sumner Strait	0.839	*Stream*	PHAR3, PLMA2, RARE3, TRRE3
		5.9495	*Roadside*	HIAU, PHAR3, PLMA2, RAAC3,RARE3, TAOF,TRHY,TRRE3
		0.37	*Stream Crossing*	PHAR3, PLMA2
		0.56	*MAF*	HIAU, PHAR3, PLMA2, RARE3, TAOF, TRHY, TRRE3
WRD	Wrangell Island-Frontal Eastern Passage	0.0007	*Stream*	PHAR3
		0.1065	*Roadside*	PHAR3, RARE3, TRHY, TRRE3
		0.0014	*Rock Pit*	HICA10, PHAR3, TAOF, TRHY

Table A2. List of the plant codes and corresponding scientific and common names for the weed species documented in the project area. The table also indicates which weeds are target species. Target species are those of greatest concern; they have been determined to pose a threat to the ecological integrity or desired condition of the sites they occupy.

Plant Code	Scientific Name	Common Name	Target
ACPT	*Achillea ptarmica*	sneezeweed	N
AGCA5	*Agrostis capillaris*	colonial bentgrass	N
AGGI2	*Agrostis gigantea*	redtop	N
AGST2	*Agrostis stolonifera*	creeping bentgrass	N
ALGE2	*Alopecurus geniculatus*	water foxtail	N
ALPR3	*Alopecurus pratensis*	meadow foxtail	N
ANCO2	*Anthemis cotula*	stinking chamomile	N
ANOD	*Anthoxanthum odoratum*	sweet vernalgrass	N
BRINI	*Bromus inermis ssp. inermis*	smooth brome	N
CEFO2	*Cerastium fontanum*	common mouse-ear chickweed	N
CESTM	*Centaurea stoebe* ssp. *micranthos*	spotted knapweed	Y
CIVU	*Cirsium vulgare*	bull thistle	Y
COCO7	*Cotula coronopifolia*	common brassbuttons	Y
CRTE3	*Crepis tectorum*	narrowleaf hawksbeard	Y
DAGL	*Dactylis glomerata*	orchardgrass	N
DEEL	*Deschampsia elongata*	slender hairgrass	N
DIPU	*Digitalis purpurea*	purple foxglove	Y
EUNE3	*Euphrasia nemorosa*	common eyebright	N
FRAN	*Fragaria ananassa*	strawberry	N
GNPA	*Gnaphalium palustre*	western marsh cudweed	N
HIAU	*Hieracium aurantiacum*	orange hawkweed	Y
HIMU	*Hieracium murorum*	wall hawkweed	Y
HOJU	*Hordeum jubatum*	foxtail barley	N
HOLA	*Holcus lanatus*	common velvetgrass	N
HYPE	*Hypericum perforatum*	common St. Johnswort	Y
HYRA3	*Hypochaeris radicata*	hairy cat's ear	Y
IRPS	*Iris pseudacorus*	paleyellow iris	N
LEVU	*Leucanthemum vulgare*	oxeye daisy	Y
LOCO6	*Lotus corniculatus*	bird's-foot trefoil	Y
LOPE80	*Lotus pedunculatus*	big trefoil	N
LOPEM2	*Lolium perenne* ssp. *multiflorum*	Italian ryegrass	N
LOPEP	*Lolium perenne* ssp. *perenne*	perennial ryegrass	N
LUPOP4	*Lupinus polyphyllus* ssp. *polyphyllus* var. *polyphyllus*	bigleaf lupine	N
MADI6	*Matricaria discoidea*	disc mayweed	N
MELU	*Medicago lupulina*	black medick	N
MEOF	*Melilotus officinalis*	sweetclover	Y
MYMU	*Mycelis muralis*	wall-lettuce	N
MYSC	*Myosotis scorpioides*	true forget-me-not	N
PHAR3	*Phalaris arundinacea*	reed canarygrass	Y
PHCA5	*Phalaris canariensis*	annual canarygrass	N

Plant Code	Scientific Name	Common Name	Target
PHPR3	*Phleum pratense*	timothy	N
PLMA2	*Plantago major*	common plantain	Y
POAN	*Poa annua*	annual bluegrass	N
POCO	*Poa compressa*	Canada bluegrass	N
POCU6	*Polygonum cuspidatum*	Japanese knotweed	Y
POPR	*Poa pratensis*	Kentucky bluegrass	N
POTR2	*Poa trivialis*	rough bluegrass	N
RAAC3	*Ranunculus acris*	tall buttercup	Y
RARE3	*Ranunculus repens*	creeping buttercup	Y
RUAC3	*Rumex acetosella*	common sheep sorrel	N
RUCR	*Rumex crispus*	curly dock	N
SAPR	*Sagina procumbens*	birdeye pearlwort	N
SCPH	*Schedonorus phoenix*	tall fescue	N
SOAU	*Sorbus aucuparia*	European mountain ash	Y
STME2	*Stellaria media*	common chickweed	N
TAOF	*Taraxacum officinale*	common dandelion	Y
TAVU	*Tanacetum vulgare*	common tansy	Y
TRAE	*Triticum aestivum*	common wheat	N
TRHY	*Trifolium hybridum*	alsike clover	Y
TRPR2	*Trifolium pratense*	red clover	Y
TRRE3	*Trifolium repens*	white clover	Y
VESES	*Veronica serpyllifolia* ssp. *serpyllifolia*	thymeleaf speedwell	N

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Appendix B. Weed Treatment Plan and Pesticide Use Proposal (PUP)

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Wrangell-Petersburg Weed Management Project

Weed Treatment Plan

Implementation Worksheet

The purpose of this tracking form is to document how project design features (PDFs) are applied and non-target resources are protected as outlined in the Wrangell-Petersburg Weed Management Environmental Assessment (Section 2.5).

This form shall be completed annually, prior to treatments, by the Invasive Species Coordinator for each Ranger District and circulated to the ID Team for review. Implementation may occur with the Responsible Official's approval.

When herbicide treatment is the proposed treatment type, a Pesticide Use Proposal (PUP) must also be completed, signed by the Regional Pesticide Use Coordinator, and kept with the implementation records for this project.

District:______________________________________

Located in a Wilderness Area: Y/N

Treatment Area (6th level HUC):____

GIS Coordinates (see attached map):________________

Site Type:_____________________________________

Site ID (taken from NRIS-IS database):_______________________________________

EDRR Site: Y/N

Target Species: ____

Treatment Method: ( ) Herbicide[1] ( ) Manual ( ) Mechanical

Manual/Mechanical treatment method(s):_________________________________

Herbicide Formulation(s):____
Adjuvants used:____
Herbicide application method:____
Herbicide rates:____

Acres to be treated: _______ Is this a re-treatment, if so, how many previous visits? ________
FACTS ID for retreatments: _____________________________

What sort of treatment has occurred previously?

- Species treated_____________________

[1] PUP required.

- Treatment methods use:_____________
- Acres treated_____________________
- Year(s) treated____

Is this adjacent to a lake/wetland/or stream: Y/N Other:______________________________

Soil Type:____

Sensitive plants/MIS species to consider found through pre-project implementation review:
( ) fish ( ) wildlife ( ) plant (or botanical)

Species names:____

Project Design Features (PDF)
Document PDFs to be applied during treatment:

Resource Comments and Considerations

Human Health

Cultural Resources:

Wildlife:

Subsistence:

Recreation:

Aquatic Organisms:

Sensitive and Rare Plants:

Soils and Wetlands:

Hydrology:

Wilderness:

Roadless:

Treatment costs

Management code(s) used:

Allocation Amount:

Cost/acre:

PESTICIDE-USE PROPOSAL (Reference FSM 2150)

To complete this form, see **Instructions for Form FS-2100-2, Pesticide-Use Proposal**

AGENCY/ COOPERATOR	CONTACT NAME, PHONE NUMBER, and E-MAIL	REGION	FOREST/ DISTRICT	DATE SUBMITTED

1) OBJECTIVE a) Project name and/or identifier b) Specific target pest(s) c) Purpose	
2) PESTICIDE PRODUCT(S) a) Trade name b) Formulation as purchased c) Restricted-use pesticide (yes/no) d) EPA registration number e) Common name of chemical(s) f) AI, AE, IU, or PIB expressed as % or concentration	
3) TYPE OF APPLICATION a) Method b) Equipment	
4) FIELD APPLICATION INFORMATION a) Formulation of material to be applied b) Planned application rate c) Dilution rate d) Diluent e) Pounds of AI or AE per acre (or other applicable rate) f) Other pesticides being applied to proposed treatment site(s)	
5) TREATMENT AREA DESCRIPTION a) Targeted treatment area b) State and county c) Site description d) Estimate of acres (or other unit) to be treated e) Number of applications f) Month(s) and year(s) of application	
6) SENSITIVE AREAS a) Special designated area (if applicable) b) Areas to be avoided c) Areas to be treated with caution	
7) PROJECT IMPLEMENTATION a) Trained/certified personnel to be used b) Personal safety c) State and local coordination d) Best management practices e) Monitoring f) Additional project information	
8) REVIEWER(S) SIGNATURE(S) a) Pesticide use coordinator b) Other reviewer(s) (as necessary)	Date: Date:
9) APPROVAL (signature of approving official)	Date:

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Instructions for Form FS-2100-2, Pesticide-Use Proposal

AGENCY INFORMATION (Header)

Provide requested information.

OBJECTIVE (Block 1)

a) Project name and/or identifier – Include the local project name and/or identifying name such as the name of the relevant NEPA compliance document and date of decision. [Note–Environmental analyses (EA's and/or EIS's) may be cited within the Pesticide-Use Proposal for additional information.]

b) Specific target pest(s) – Identify target pest(s) by the common and scientific name. Also identify the life cycle stage for animals (adult, larva, etc.) or stage of growth for plants (pre-emergent, seedling, sapling, etc.) at the time of application. A table may be attached to list information for multiple targets.

c) Purpose – State exact purpose of pesticide use.

PESTICIDE PRODUCT(S) (Block 2)

a) Trade name – State the trade name(s) exactly as shown on container (e.g., Roundup Ultra, Tordon 22k, Sevin SL).

b) Formulation as purchased – State the formulation (liquid, dust, granule, pellet, emulsion, bait, solution (ready-to-use without dilution), gas, flakes, packets, etc.) of each pesticide product as purchased.

c) Restricted-use pesticide (yes/no) – Specify whether the pesticide is a restricted-use pesticide or not.

d) EPA registration number – State the EPA registration number from the pesticide label.

e) Common name of chemical(s) – State the common name (glyphosate, picloram, carbaryl, etc.) of active ingredient(s) as given on the pesticide label. When more than one pesticide active ingredient will be used during treatment of a single pest, list active ingredients separately by placing the word "and" between them to indicate the different pesticide names (e.g., aminopyralid and 2, 4-D). When alternative materials are proposed for the application, use the word "or" in listing the names.

f) AI, AE, IU, or PIB expressed as % or concentration – State the percentage (%) or concentration (lb/gal, oz/oz, etc.) of any active ingredient (AI), acid equivalent (AE), international units (IU), or polyhedral inclusion bodies (PIB) as shown on the pesticide label. For herbicides, report as acid equivalent rather than active ingredient when available. IU may be expressed as billion international units/gal for bacteria, and PIB may be expressed as billion polyhedral inclusion bodies/oz for viruses, as appropriate.

TYPE OF APPLICATION (Block 3)

a) Method – Indicate the specific method of application to be used (aerial, ground, aquatic, etc.).

b) Equipment – Indicate the specific type of equipment to be used such as backpack sprayer, helicopter, fixed-wing aircraft, mist blower, hydraulic sprayer, injector, packets, etc.

FIELD APPLICATION INFORMATION (Block 4)

a) Formulation of material to be applied – Indicate the pesticide material to be applied in the field (spray liquid, pellets, granules, dust, bait, gas, flakes, packets, etc.).

b) Planned application rate – Indicate the amount of liquid or dry material to be applied on a per unit area basis (gal/acre, lbs/acre, oz/1,000 ft^2, etc.). In general, calibration of liquid sprayers requires determination of the application rate in gallons per acre (GPA).

c) Dilution rate – Indicate the pesticide concentration to be applied in the field as the amount of concentrate to be mixed with a specified amount of diluent (e.g., 1 qt. Tordon 22K/25 gallons of total mix).

d) Diluent – Identify the material (water, oil, talc, etc.) that will be used to reduce the concentration of a pesticide formulation at the time of application.

e) Pounds of AI or AE per acre (or other applicable rate) – State the pounds of active ingredient (AI) or acid equivalent (AE) (specify which) to be applied on a per acre basis, unless some other unit is indicated on the label. If reporting acreage is not appropriate, indicate units used. If a pesticide for trees or brush is to be applied by aircraft or mist blower, express as pounds of AI or AE per acre. For outdoor spot applications, the rate of application should also be expressed in pounds of AI or AE per acre. For pesticide treatment of individual trees, the application rate for AI or AE is described as number of trees and rate per tree (or an equivalent measure).

Indoor applications of residual sprays may be expressed as gallons per 1,000 square feet (at whatever percent AI in the prepared spray) or simply as pounds AI per 1,000 square feet. For spraying pesticide on most indoor surfaces to the point of runoff, assume the rate to be 1 gallon of formulation per 1,000 square feet. If a dust is being used, express as ounces or pounds of AI in prepared dust per M (1,000) square feet. The AI rate of application for fumigants or indoor aerosols is expressed as pounds AI per M (1,000) cubic feet. Rodent baits should be given as ounces or pounds of AI in the prepared bait per bait station.

The rate of application of AI for pesticide treatments in water may be expressed in parts per million (ppm) or parts per billion (ppb). Specify whether ppm or ppb is by weight or volume.

f) Other pesticides being applied to proposed treatment site(s) – Indicate other pesticides currently being applied or will be applied to the same site(s) proposed for treatment within the same year (e.g., ongoing carbaryl treatment of trees in the same campground where invasive plants will be treated; pesticides applied under other Pesticide-Use Proposals within the same treatment area).

TREATMENT AREA DESCRIPTION (Block 5)

a) Targeted treatment area – Specify area(s) to be treated (wilderness area, stretch of river, grazing allotment, etc.).

b) State and county – Indicate State(s), county(ies), and any other geographic jurisdictions involved with the area(s) to be treated.

c) Site description – Provide information on the type of area (rangeland, tree nursery, etc.) to be treated and any specific parts or portions of the area that will be treated such as ditch banks, rights-of-way, etc. When applicable, specify whether the pesticide will be applied directly to water or near the water's edge (e.g., riparian area). State the distance to nearest surface water (lakes, streams, etc.) or wetland. Where applicable, indicate the general slope of the treated area(s). For aquatic applications, indicate water quality (hardness and pH) of treated water body if available or applicable.

d) Estimate of acres (or other unit) to be treated – Provide an estimate for acres to be treated, unless other units are otherwise applicable. When projects require repeat applications, estimate only those acres to be treated in the first application.

e) Number of applications – For projects that will require repeat applications within the same area, provide an estimate of the number of treatments that will be used per season.

f) Month(s) and year(s) of application – Indicate the month(s) and year(s) that applications are planned. If necessary, provide general season of treatment (e.g., spring, summer, or fall) or an estimate of the range of years for treatment (e.g., 2011 through 2019).

SENSITIVE AREAS (Block 6)

a) Special designated area (if applicable) – Identify any wilderness area, Research Natural Area (RNA), botanical area, or other similar designated area that is in proximity to areas to be treated. Describe specific precautionary measures that will be taken to protect identified special designated area (e.g., no pesticide application with mechanical ground equipment inside wilderness area).

b) Areas to be avoided – Identify specific areas to be protected from direct application, drift, or runoff (waterbodies, private property, T&E species habitat, etc.). Describe specific precautionary measures that will be taken to avoid presence of pesticide in identified area (e.g., no application within 100 feet of stream).

c) Areas to be treated with caution – Identify sensitive areas (riparian areas, areas with a shallow water table, T&E species habitat, etc.) that require special precautions during treatment to avoid undue impacts or contamination. Describe specific precautionary measures that will be taken to protect identified area (e.g., use of pesticides with an aquatic label in riparian areas).

PROJECT IMPLEMENTATION (Block 7)

a) Trained/certified personnel to be used – Provide information regarding personnel who will be performing the actual pesticide work. Applicators and personnel serving as supervisors must be trained

in the proper application of pesticides. Personnel handling or applying a restricted-use pesticide must be state or Federally certified for restricted-use pesticide operations.

b) Personal safety – State any restricted entry interval (REI) required by the pesticide label following application. If additional personal protection equipment other than what is on the label is proposed, please describe.

c) State and local coordination – Indicate any coordination at the State or local level that will be made for the project.

d) Best management practices – Describe or reference the best management practices that will be followed for pesticide application such as lowest effective application rate, equipment calibration, field scouting/monitoring before pesticide application, buffer zones, and weather restrictions (wind speed limit, inversion avoidance, etc.).

e) Monitoring – Describe monitoring required for treatment effectiveness and any other monitoring that will be conducted.

f) Additional project information – Describe other information pertinent to the project that is not addressed in sections above (e.g., information as to whether the project will be conducted by force account or through a contract).

REVIEWER(S) (Block 8)

a) Pesticide use coordinator – A pesticide use coordinator's signature at the district, forest, or regional level (as appropriate) is required before final approval.

b) Other reviewers (as necessary) – Include any necessary signature(s) of specialists in pertinent programs such as biologists, entomologists, agronomists, wilderness program managers, or Research Natural Area (RNA) program managers that are required before final approval.

APPROVAL (signature of approving official) (Block 9)

Signature of approving line officer with delegated signing authority

USDA Forest Service
Petersburg Ranger District, Tongass National Forest
PO Box 1328
Petersburg, AK 99833